Why Are Fewer Workers Earning Middle Wages and Is It a Bad Thing?*

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Abstract

We re–examine changes in U.S. employment by skill, departing from most previous literature by equating skill with wage rather than occupation. By assigning workers to real hourly wage bins with time-invariant thresholds and tracking over time the shares of workers in each, we find a steady decline since 1979 in the share of both men and women earning middle wages, consistent with occupation–based analysis. However, we find that both over the business cycle and the longer run, the shares of workers in the top and bottom bins move in opposite directions. This is inconsistent with the employment polarization found in occupation–based analysis, suggesting that labor market developments are not fully explained by computerization and automation displacing workers from middle–pay to low–pay occupations. The decline in the middle share has been a good thing for women throughout and to a lesser extent for men since 1992, representing mobility to higher wage bins, while it was a bad development for men in the 1980s, representing mobility to lower wage bins. We do not find clear evidence that of labor market weakening for young college graduates since 2000, casting doubt on the hypothesis that demand for skilled workers has fallen as the computer revolution has matured.

1 Introduction

A decline in the "middle class" has become a concern not only in the United States, but also in other countries, and not only for academics, but also for politicians and the public.[1] "Middle class" means different things to different people, but whatever the measure, a decline in the middle class is generally considered to be a bad thing. While some observers consider it undesirable in and of itself, others worry that it implies a reduction in average income (New York Times 2015) or is a threat to liberal democracy (Fukuyama 2009). Economists focusing on workers fear that a decline in employment in middle–pay occupations is associated with a displacement of middle–skill workers into lower–pay occupations, resulting in what is known as employment polarization and increased wage inequality.

The phenomenon of employment polarization – faster employment growth in high and low–paid occupations than middle–paid occupations – has been demonstrated for the United States[2] as well as other countries.[3] Most authors believe that an important force behind employment polarization is computerization and automation: these investments are complementary with workers in high–skill occupations and raise their labor demand, while reducing demand for workers in middle–pay occupations through the substitution of routine tasks, and increasing the supply of workers in low–pay occupations as middle–skill workers crowd in to those occupations.[4] Under some conditions, this mechanism could lead not only to employment polarization, but also to the patterns of increased wage inequality seen in the United States since 1990 (Autor and Dorn 2013; Autor 2015). Recently, studies such as Schmitt, Shierholz and Mishel (2013) have found that employment polarization in the United States ended around 2000. Beaudry, Green and Sand (2013) believe the end of polarization is explained by a fall in demand for skilled workers since 2000, possibly due to the maturing of the computer revolution.

In this paper, we re–examine changes in U.S. employment by skill, equating skill with wage rather than occupation as in most of the earlier literature. We revive and improve an approach fallen into disuse, assigning workers to real hourly wage bins with time-

[1] E.g. Pew Research Center (2016); Bloomberg (2016); Figaro (2016) citing the International Labour Office (n.d.) study of Europe.

[2] Levy and Murnane (1992); Acemoğlu (1999); Autor, Levy and Murnane (2003)

[3] Goos and Manning (2007); Goos, Manning and Salomons (2009); Green and Sand (2015).

[4] Autor, Katz, Kearney (2008); Autor, Dorn and Hanson (2015); Spitz–Oener (2008).

invariant thresholds and tracking over time the shares of workers in each.[5] We conduct our analysis with the U.S. Current Population Surveys' (CPS) Merged Outgoing Rotation Groups (MORG). Our use of annual data allows us to distinguish trends and business cycles and to capture accurately the timing of longer–term patterns, unlike most of the previous literature which uses decadal census data for years until 2000. We confirm that the share of workers with middle wages is declining over 1979–2016, and examine the short– and long–term employment patterns in the shares with high and low wages to determine whether the decline may be deemed good or bad for workers, and whether it is associated with employment polarization: in this setting, employment polarization would imply rising shares of workers in both top and bottom wage bins. We also conduct analysis by age and education to seek evidence of declining demand for skilled workers after 2000.

Following this graphical analysis of changes in employment shares, we investigate which factors if any might be associated with employment polarization before 2000 or a fall in demand for skilled workers after 2000. To do so, we perform Oaxaca–Blinder decompositions of year–to–year and long–run changes in the share in each wage group into changes in individual and job characteristics and changes in returns to characteristics. For some analysis, we augment the data with the CPS May and October supplements. In addition to shedding light on the specific labor market theories related to computerization and automation, the Oaxaca analysis paints an overall picture of what is influencing the shares of workers in wage bins over time.

We employ the real wage bin approach in part because we suspect many people citing the occupation–based analysis believe it to be based on the wages of individual workers, or believe the two approaches to be equivalent. Due to the large wage and skill variation within occupations, this is not the case. Over time, employment growth may occur disproportionately in high-wage jobs within low–average wage occupations, or low–wage jobs within high-average wage occupations. It is therefore useful to consider the theories emerging from occupation–based analysis in a different and simpler empirical light. Our approach precludes the study of tasks: the purpose of the literature's focus on occupations is to infer worker tasks in the absence of individual–level task information and assess which workers are vulnerable to computerization or automation. Yet harmonization of changing occupation codes is necessarily imperfect, particularly over long periods of time,

[5] Bluestone and Harrison (1988); Levy and Murnane (1992); also LoPalo and Orrenius (2015).

and indeed, the occupation codes change because the nature of occupations changes over time, including through upskilling (Levy, Murnane and Tyler 1995; Spitz–Oener 2006 for Germany).[6]

We find that the steady decline in the share of workers in the middle two wage groups belies offsetting forces that vary over time and by gender, and variously reflects either upward mobility (workers moving faster from the middle to the top than from the bottom to the middle) or downward mobility (workers moving faster from the middle to the bottom than from the top to the middle), but not employment polarization. The business cycle clearly has a tendency to cause downward mobility in recessions and upward mobility in recoveries and booms.[7] However, the share of workers in the top and bottom groups generally move in opposite directions over the longer term as well. This contrasts with the polarization found by LoPalo and Orrenius (2015) between 1979 and 2012, which is driven by the comparison of the share of workers in the bottom wage group in the relatively buoyant labor market of 1979 and the depressed labor market of 2012. We show that the 1990s employment polarization found in papers such as Autor (2015) is observed only in their occupation–based analysis and explain the origin of the apparent contradiction.

The lower frequency trends are very different by gender. After adjusting shares for HP–filtered GDP, we see that women have experienced upward mobility since 1982, with the share in the bottom wage group falling considerably, the middle two groups falling slightly, and the top wage group rising considerably. This upward mobility occurred despite composition effects generated by the 1980s surge in labor force participation. The decline in the middle is thus a positive development for women. Men have experienced mild upward mobility since 1992, with a small increase in the share in the top wage group at the expense of middle groups. However, men experienced strong downward mobility in the 1980s as the shares of the upper two wage groups both shrank. The decline in the middle for men was thus deleterious in the 1980s and beneficial in the later period.

These results, combined with the failure of our Oaxaca decompositions to identify any polarizing factor, indicate that the theory that computerization and automation are

[6] The limitations of occupation–based analysis have been pointed out by Schmitt, Shierholz and Mishel (2013), who also dispute the presence of employment polarization even in occupation–based analysis. See also Gittleman and Howell (1995). Gottschalk, Green and Sand (n.d.) grapple with the issue of the changing skills associated with occupations.

[7] This is notwithstanding the fact that unskilled workers disproportionately exit employment in recessions and disproportionately enter employment in booms.

reducing employment at middle skills and increasing it at low skills is not supported by an empirical approach measuring skill by wage. Our results also cast doubt on the theory that a reduction in the return to cognitive skills since 2000 is reducing the demand for skilled workers. The Oaxaca decompositions show no change since 2000 associated with the return to education. We find no downward mobility since 2000 of college graduates aged 25–35 (the group preferred by Beaudry, Green and Sand 2013), and we find that the apparent downward mobility of college graduates under 30 with five or fewer years of potential experience (the group preferred by Gottschalk, Green and Sand n.d.) is explained by the business cycle.

Our Oaxaca decompositions indicate only a modest role for changing returns to occupations, which contrasts with (though does not contradict) the Firpo, Fortin and Lemieux (2013) study of wage inequality and occupations. These authors find changing returns to occupational tasks, particularly tasks susceptible to offshoring, automation, and computerization, helpful in explaining the evolution of the 90–50 and 50–10 wage differentials since the late 1970s.

The Oaxaca decompositions improve our understanding of what factors are strongly associated with shifts in wage bin shares. Improved characteristics have been a strong and steady force for upward mobility throughout, with age and education leading the shares of women in the bottom and top wage groups to fall and rise, respectively, by at least 0.20 percentage points per year over the study period, with annual changes for men varying between 0.15 and 0.23 percentage points in absolute value. The decline in manufacturing and especially deunionization help explain why men instead experienced downward mobility in the 1980s: together those factors increased the share of men in the bottom wage group by 0.15 percentage points per year and reduced the share in the top by 0.13 percentage points per year.

Changes in returns to characteristics led to upward mobility for women up until 2001 and downward mobility for men throughout the study period. Women's upward mobility was driven by the falling return to union membership and the changing returns to industry, which together reduced the share in the bottom group by 0.20–0.21 percentage points per year in the 1980s. Men's downward mobility resulted from small or moderate changes in the returns to several characteristics, including state of residence. Changes in the return to education were also influential, tending to move both male and female workers to the middle wage groups in the 1980s and 1990s. More research examining the interaction

between long–term trends and the business cycle, along the lines of Foote and Ryan (2015), Jaimovich and Siu (2014) and Hershbein and Kahn (2016), but deemphasizing occupations, would be fruitful.

2 Data

We rely principally on the merged outgoing rotation groups (MORGs) from the Current Population Surveys (CPS) of 1979–2015, retaining imputed values following Card and DiNardo (2002). We draw a sample of workers aged 18–64 who are not self–employed, and compute hourly wages by using reported hourly wages for hourly–paid workers, and dividing weekly earnings by weekly hours for salaried workers. We adjust wages to represent 2014 dollars by deflating with the CPI–U. We drop wages below \$2 in 2014 \$ or above \$200 if usual weekly hours are less than or equal to 15.

Because the heaping of wages at round numbers would otherwise cause sudden jumps over time in the shares of workers in wage bins, we add some randomness to each wage. We draw a random value k_i from a standard normal distribution and multiply the wage by $0.2k_i$, or equivalently, add $0.2k_i$ to the log wage. This acts to smooth the wage distribution by dispersing the heaps of workers who report particular round-number nominal wages like \$10 per hour or \$15 per hour. Without this randomness, inflation – combined with the clustering of workers at fixed nominal wages – causes frequent discontinuous shifts in employment shares.[8]

Because union status and coverage by a union contract are not included in the MORGs until 1983, in some analysis we substitute the CPS May supplement for the early years (while retaining the wage thresholds used in the MORGs). The disadvantage of the May supplement is that the sample size is considerably smaller, reducing the precision of the estimates. We do not drop imputed wages, which could affect the estimated changes in return to union status (Hirsch and Macpherson 2003).[9]

We allocate each worker in each year to one of four wage bins, whose thresholds are constant in real terms over time. We choose the thresholds that divide workers into quartiles in 1979 (in years other than 1979, shares sum to one but are not necessarily equal). The same bins are used whether men and women are pooled or examined separately.

[8] We have experimented with the amount of randomness to be added, and found that $0.2k_i$ is the smallest amount that serves to prevent the discontinuous shifts.

[9] We will check sensitivity to this in a future version.

Workers in the bottom wage bin earn $11.69 or less (in 2014 dollars), workers in the lower middle group earn more than $11.69 and less than $16.99, workers in the upper middle group earn between $16.99 and $25.18, while workers in the top group earn more than $25.18. We confirm that patterns are similar when five groups are defined based on quintiles rather than quartiles in 1979.

To assess patterns by education group, we define six dummies: low dropout (eight or fewer years of education), high dropout (9–11 years of education), high school graduate (12 years of education), some college (13–15 years of education), college graduate (16 years of education) and post college (more than 16 years of education). We employ nine age dummies, a dummy for being a union member and a dummy for being covered by a union contract without being a union member.[10] We harmonize 22 occupational categories and 34 industry categories across the surveys: see the Data Appendix. The means of the variables for women and men in selected years are given in Appendix Tables 1 and 2.

3 Methods

We present some data series adjusted for the business cycle, and we perform Oaxaca decompositions of the changes in shares of workers in each wage bin over time. We perform the decompositions both on a yearly basis and over longer periods.

3.1 Adjusting for the business cycle

We adjust time series for shares in each wage group for the business cycle in several steps. We first regress each time series of 38 observations on the GDP deviation from the HP trend and its first two lags, using a linear probability model. We then compute the residuals and add the estimated intercept, thus predicting what the shares would have been in each year had filtered GDP and its two lags been at their average values. Figure 1 plots HP–filtered GDP using the smoothing parameter $\lambda = 100$. This is at the high end of values used for annual data, and well above the value of 6.25 recommended by econometricians, but the HP–filtered GDP coefficients are jointly insignificant in the

[10] In early analysis we included a dummy for part–time status, but dropped it out of concern that it was influenced by measurement error in hours of work. Place of birth is available from 1994. In a future version, we will investigate the importance of being born abroad. Enrollment status is available from 1984: in early analysis, student status played no important role.

adjustment regressions at small values, and the adjustment has little effect on the wage groups shares for values below 100. Filtering is performed using data from 1963–2016.

3.2 Oaxaca–Blinder decompositions

We perform Oaxaca–Blinder decompositions of the change in the share in a wage bin between selected years. For this purpose, we use the Oaxaca command in Stata from Jann (2008), which permits the contributions of individual covariates and their coefficients to be computed. The base year is the earlier of the pair of years. Oaxaca decompositions are additive, meaning that 100% of the changes between any pair of years are explained by changes in covariates or their coefficients. Despite this, one can view the contribution of the change in the coefficient on the constant (the change in the intercept), as representing an unexplained component, as it is not associated with any observed variable.[11] The results are affected by selection – into and out of the labor force, and into and out of union membership, for example – and the estimated returns are not necessarily causal.

We perform Oaxaca–Blinder decompositions using the MORGs for the periods 1983–1990 and 1990–2008, but also for 1980–1990 using the May 1980 CPS. We select the years in question because the level and first two lags of HP–filtered log GDP are similar in 1980, 1990 and 2008 (see Figure 1). We have also performed preliminary analysis based on those October supplements (1984, 1989, 1993, 1997, 2001 and 2003) which ask about computer use at work, those these sample sizes are small.

We also construct graphs based on Oaxaca decompositions of changes in wage group shares between each adjacent pair of years for 1983–2015. The aim is to show how the share of workers in a group would have evolved yearly from 1983 had only a single covariate or its coefficient evolved, with all others held constant. For example, to show the effect of changing education, we plot the 1983 predicted share for 1983, then add the contribution of changing education to the 1983–1984 group share and plot this for 1984, then add to this 1984 value the contribution of changing education to the 1984–1985 group share and plot this for 1985, etc. These adjacent-year plots facilitate a finer appreciation of the timing of various effects than do the 1980–1990 and 1990–2008 decompositions, but they do include business cycle effects.[12]

[11] Some research using Oaxaca decompositions refers to changes in all coefficients – intercept and slope – as representing the "unexplained" component. We consider the unexplained component to consist only of changes in the intercept.

[12] We do not do graphical analysis of 1980–1982 because there is no union information in the CPS in

4 Is there employment polarization?

We depict in Figure 2 the simple time series of the shares of workers in each of the four wage groups from 1979–2016; by construction a quarter of workers are in each group in 1979. The graph does show a gradual decline in the share of the two middle groups, which is a characteristic of employment polarization. However, it does not show simultaneous increases in the shares in the top and bottom groups, which is the other characteristic of polarization. In the recessions of the early 1980s, early 1990s and late 2000s, the share in the bottom group rises and in the top group falls, while the opposite occurs in the expansion periods, and especially in the boom of 1996–2001. What is happening at lower frequencies than the business cycle is clearer when the shares are adjusted for the business cycle, as in Figure 3. With this adjustment, the top share trends upwards from 1992, while the bottom share trends downwards over the same period. Neither changes much during the 1980s, while the sharp fall in the top share and the sharp rise in the bottom share of 1979—1981, which appeared to be the result of the 1980 recession in Figure 2, remain despite the adjustment for the business cycle. These changes dwarf changes in the middle shares. The absence of employment polarization is particularly clear if the period since the apparently one–off changes of 1979–1982 is considered.

We find a much higher increase in the share of workers in the top wage group than LoPalo and Orrenius (2015). This study and others finding employment polarization have used data from the decennial census and the American Community Survey (ACS), which could be one reason for the different results. We do obtain slightly different results using the Census and the ACS, though the main differences between our CPS results and the LoPalo and Orrenius (2015) results are the addition of randomness to our CPS wages and the comparison in LoPalo and Orrenius of a boom year (1979) and a bust year (2012).

Another difference between our work and previous studies is that some of those studies have observed polarization in employment growth when sorting workers by the average wage of their occupations, rather than by the workers' actual wages. The former pattern has been found to be most marked in the 1990s (e.g. Autor 2015, and also Schmitt et al. 2013), and we accordingly group our data by occupation for 1989–1999 and show employment growth by occupation in Figure 4 (c.f. Figure 2 in Autor 2015). Putting agricultural occupations aside (they are not included in Autor's graph), there is indeed

1982, and because the samples from the Mays are small, especially for 1981.

a weak pattern of polarization – employment growth in the occupations with the lowest average wage in 1979, a decline in three large low–wage to middle–wage occupations, and generally high employment growth in the better paid occupations – even if the exact numbers do not correspond to those based on census data.[13]

By contrast, we find a strong decline in the share in the bottom wage group in the 1990s and a stable share in the middle groups. This is not an artifact of differently sized groups of workers. If we define the bottom group as the bottom 20% (rather than 25%) of workers in 1979, our bottom group comprises a very similar share of workers to the share in the low–paid occupations, and we obtain roughly the same results as when we use our preferred 25% bin. We show in Figures 5 and 6 how the apparent contradiction comes about. In the 1990s boom, most low–wage occupations actually saw a reduction in bottom bin employment (Figure 5; an unreported figure shows their employment growth came in the lower middle), while many high–wage occupations had only a small share of their employment growth come in the top wage bin (compare with Figure 4).

The patterns in the shares of workers in our wage bins shown in Figures 2 and 3 mask very different evolutions over time for men and women, although for both the share of workers in the upper middle wage group declines and the share in the lower middle is stable. For women, the wage shares plotted in Figure 7 and especially the business–cycle adjusted wage shares plotted in Figure 8 suggest that the principal development is that women are steadily moving up through the wage groups (which continue to be defined based on the pooled male and female sample). The adjusted share in the bottom group declines steadily over time (with the exception of 1979–1981), the adjusted share in the top group rises steadily over time (with the same exception), the share in the upper middle is stable, and if the share in the lower middle falls, it must be because women are moving faster from the lower middle to the upper half than from the bottom to the lower middle. A decline in the lower middle share is a good thing in this situation.

The unadjusted shares in Figure 7 show some mild business cycle patterns, particularly in the late 1990s expansion which reduced the share in the bottom group considerably. The unadjusted patterns also suggest that female progress began to falter and employment began to polarize around 2002. The adjustment for the business cycle in Figure 8 shows that some of this slowdown is due to a change in the macro environment, but confirms a

[13] For example, employment in production occupations declines in our data while it rises in the census data, albeit weakly.

slight underlying slowdown.

Men's patterns are quite different. The effects of recessions on the top and bottom wage groups are more marked than for women in the unadjusted wage shares of Figure 9. The adjusted shares in Figure 10 suggest two distinct periods for men: the 1980s, when men slid down through the wage groups; and post–1992, when there was a partial recovery with movement from the middle groups to the top group (the path of the bottom group is sensitive to the HP–filter smoothing parameter, but is approximately flat here). The decline in the share of men in the upper–middle wage group therefore represents an unwelcome development in the 1980s, and a welcome one since then. The different patterns over time and the contrast with women show that a decline in the middle class cannot be examined in isolation from the larger context, and may be good or bad.

Appendix Figures A1–A5 show that the same conclusions obtain based on analysis of five wage groups (representing quintiles in 1979) rather than four. We have also verified robustness to using ten wage groups (deciles in 1979), weighting observations by hours worked, and using four groups based on quartiles in 2007 instead of 1979.

5 Do skilled workers fare worse after 2000?

Although we have not found evidence of employment polarization before 2000, we seek evidence for the reduction in the demand for skilled workers after 2000 postulated by Beaudry, Green and Sand (2014). We begin by considering the skilled group whose wages they consider likely to reflect market wages, college graduates aged 25–35. Panel A of Figure 11 shows the wage bin shares for this group. Most of the change over time comes from an upward trend in the share in the top wage bin. For most of the 2000s, the unadjusted share is indeed below the 2000 level, but by 2016 (beyond the data available to previous authors) the share has returned to the 2000 level, and the business–cycle adjusted shares in Panel B suggest a stable share of workers in the top bin since 2000.

Panels C and D show the equivalent graphs for the skilled group preferred by Gottschalk, Green and Sand (n.d.): college graduates younger than 30 and with at most five years of potential experience. This group has lower wages than the first and very cyclical shares. Adjusted for the cycle (Panel D), the share in the top bin is clearly rising from about 1992. The share in the bottom bin appears to be trending up (Panel C), but scarcely rises when adjusted for the business cycle (the path is sensitive to the choice of HP–filter smoothing

parameter). Together, the figure's four panels do not suggest a decline in demand for college graduates from 2000.

6 What is causing low–frequency changes in shares?

In this section, we perform Oaxaca decompositions to search for factors that might be polarizing employment even if we have seen that the net effect of all factors is not polarizing. In order to consider union status and also use the preferred MORG data exclusively, we begin in 1983. We include all characteristics including occupation dummies. This has the advantage that the role of changing returns to occupations, which may reflect automation and offshoring, may be assessed. It has the disadvantage that the role of changing shares of workers in occupations must be assessed at the same time, and for women particularly, movement to better–paying occupations is an outcome of interest in its own right.

6.1 Aggregate analysis

We begin by presenting aggregated results of the decompositions. In Figures 12 for women and 13 for men, we first plot the predicted shares of workers in each wage bin for reference (in solid blue): note that the y–axis scales differ across graphs. With green triangles, we plot the contributions of changes in characteristics by adding the yearly contributions cumulatively to the 1983 share: this is how the shares would have evolved due to the changes in characteristics only. With red squares, we plot how the shares would have changed had only the returns to characteristics – except the intercept – changed. Finally, with yellow crosses, we plot the influence of the changing intercept, the truly unknown component.

If changes in observable characteristics and their returns fully explained employment shifts, the intercept lines would be flat at the original, 1983 shares. At the opposite extreme, the closer the intercept line lies to the predicted share line in blue, the lower the explanatory power of observed characteristics and their returns.

The figures show that changes in characteristics are generally more influential than are changes in the return to their characteristics, and that improving characteristics have caused upward mobility, especially for women. Improving characteristics have moved women steadily from the lower two wage groups (especially the bottom) to the upper two (especially the top), reducing the bottom wage group by about six percentage points

and raising the top group by about five percentage points. Improving characteristics reduced the share of men in all three lower wage groups fairly steadily, increasing the share in the top group by about five percentage points. Appendix Figures A9 and A10, which replicate the figures for decompositions without occupation as a characteristic, show that the contribution of changes in characteristics is not very sensitive to the inclusion of occupation, as its contribution comes to some extent at the expense of increasing education.

Changes in the returns to characteristics were favorable to women from 1983–2001, reducing the share in the bottom group as fast and steadily as improving characteristics, and increasing the share in the upper middle group correspondingly, suggesting upward mobility through the lowest three wage groups. Since 2001, changes in returns to characteristics have had no effect on women. The effect of changing returns to characteristics have a different effect on men, tending to reduce the share of men in the top wage group and increasing the share in the middle groups, suggesting downward mobility through the upper three wage groups.

The contributions of characteristics and their returns do not appear to capture business cycle fluctuations, with these fluctations tending to be reflected in the intercept line. The one exception is the share of men in the top wage group: returns to characteristics do capture some of the cycles (we shall see below this is driven by the return to union status). The intercept lines generally have little trend after about 1995 (after 2001 for the share of women in the top group), indicating that trends in observed variables and their return adequately characterize changes in shares. For both men and women, unexplained factors, possibly including macro factors, pushed up the share in the bottom from especially from 1987 to 1995. Together, the intercept lines suggest an unmeasured polarizing force or combinations of forces for women until 1995, while for men they suggest downward mobility from the upper half to the lower half, especially the bottom.

In the next two sections, we examine yearly graphs with the more detailed contributions of specific characteristics and their returns for 1983–2015, but also provide tables with decomposition results for 1983–1990, capturing most of the period of male downward wage mobility, and 1990–2008, so as to report exact estimates with standard errors (Appendix Tables 3 and 4). The tables also provide decompositions for 1980–1990 using the May CPS for 1980, permitting a comparison of three years at the same point in the business cycle (1980, 1990 and 2008), which is important particularly for the comparison

of the unexplained component.[14]

6.2 Role of changes in specific characteristics

Figures 14 and 15 report the contributions to the changes in shares of changes in specific characteristics. These contributions are generally steady and monotonic. For both men and women, the most influential characteristic is education, whose increase caused upward mobility from the lower two to the upper two wage groups. Increased education reduced the share of women in the bottom group by about five percentage points and increased the share in the top by about four percentage points, while it reduced the share of men in the bottom by about two percentage points and increased the share in the top by more than three percentage points. Movement to higher-paying occupations has effects similar to rising education, not surprisingly, though smaller in magnitude and concentrated before 2002.[15] For men, rising age also has similar effects to rising education, though for women age effects are smaller. The effect of rising age tapers off around 2005, though this is compensated for by a greater effect of rising education.[16] Since men were experiencing downward wage mobility in the 1980s, rising education, occupation and age have the wrong signs in this period for explaining actual trends.

For men, deunionization helps explain downward mobility in the 1980s, moving men from the upper two groups, especially the top, to the lower two groups, especially the bottom, with the effects greatest in the 1980s. The magnitudes are smaller than those of education, occupation and age, with deunionization increasing the share in the bottom by less than two percentage points and reducing the share in the top by about two percentage points, but the patterns suggest the largest effect might have been in the omitted years 1979–1983. Changes in industry mix have effects on men qualitatively similar to the effects of deunionization but smaller. For women, deunionization and changes in industry mix have little impact. Changes in state of residence play no role for either men or women.[17]

[14] Point estimates from pooling May 1979–1981 supplements are similar.

[15] The presence of only small jumps in the plots for industry and occupation suggest the code harmonizations are satisfactory. The change in the education questions in the CPS redesign appears to have some small effects.

[16] The contribution of age, education and occupation together does fall after 2005, but for this purpose we prefer to rely on the decomposition without occupation. In these unreported results, the contribution of age and education together holds steady (see also Figures A9 and A10).

[17] Unreported results based on the October supplements indicate that men and especially women benefited greatly from the spread of computer use at work and its associated wage premium. The result for states is notwithstanding the finding of Diamond (2016) that college graduates are increasingly

6.3 Role of changes in returns to specific characteristics

Figures 16 and 17 report the contributions to the changes in shares of changes in the returns to specific characteristics. The contributions are more variable over time than the contributions of changes in characteristics, and the estimates have larger associated standard errors and some are visibly noisier: these considerations justifiy using the MORGs with their large sample size even at the cost of fewer years of data (alternatively, pairs of years could pooled).

The most influential return is the return to union status, which affects the shares approximately as much as increasing age in the previous figures, something not highlighted in the previous literature. For both men and women, the change in the return to union membership is beneficial, mainly due to a one–time change from about 1996–2002 tending to reduce the share of workers in the bottom and increase the share in the upper middle, implying upward mobility through the lower three groups. Over the whole period, the fall in the return to union membership reduced the share of women in the bottom by about three percentage points and the share of men by about two percentage points.[18] The shares of men and women in the top wage group are not very sensitive to changing returns, though the return to union status has a cyclical effect.

For women, the role of the returns to industry is similar to that of the return to union, though slightly smaller in magnitude. The unreported very detailed results of the decomposition show that a beneficial change in the return to the education sector is beneficial in the 1980s, when teacher salaries rose[19], and the favorable evolution of returns to retail trade and food and drinking establishments was influential after 1990 (possibly reflecting increased productivity in the retail sector in the 1990s). Conversely, changing returns to industry play little role for men. Changes in the return to education from 1983 to the mid 1990s tended to move men and women from the top and bottom groups into middle groups. Changing returns to states in the second half of the period tend to cause modest downward mobility for both men and women. Changing returns to occupation play a secondary role for both men and women, with the small effects observed imprecisely

concentrated in high wage, high rent cities.

[18] In this case dropping 1979–1982 involves a qualitative loss of information, as analysis using the May 1980 and 1990 MORG data sets indicates that the change in return to union status raised the share of men in the bottom (see Appendix Table 4). The implication is that the contribution must have been such as to raise the share in the bottom from 1980–1983, or that the May CPS data differ.

[19] https://nces.ed.gov/programs/digest/d09/tables/dt09_078.asp

estimated, while there is no role for the changing return to age.[20]

6.4 Summary

Figures 12-17 together show that men fared worse before 1992 than after mainly due to an unmeasured force or forces, deunionization and industry shifts in the earlier period, and a favorable change in the return to union membership that occurred after 1992. Women fared better than men before 1992 due to a beneficial unmeasured effect on the share in the top group (possibly representing increasingly lucrative college majors), faster growth in education, and the irrelevance of deunionization and changing industry mix. Women's progress slowed after about 2002 due to the worsening of the macro environment and the end of beneficial changes in return to union status and industry (it was also influenced by the end of the changes in return to education tending to cluster men and women in the middle wage groups).

These summary effects are quantified in Table 1, which reports the magnitudes and standard errors of the most influential components for the bottom and top groups in 1983–1990 and 1990–2008, aggregated from the more detailed results presented in Appendix Tables 3 and 4. We aggregate components that tend to move together, and report components contributing more than 0.10 percentage points per year in absolute value.[21] The first row of Panel B shows that increasing age and education together reduced the share of women in the bottom wage group by 0.25–0.28 percentage points per year, while boosting the share in the top by 0.20–0.24 percentage points per year. The share of men in the bottom was reduced by 0.16–0.19 percentage points per year, while the share in the top was boosted by 0.15–0.23 percentage points per year.[22] Women's progress through greater occupational attainment provided upward mobility in the earlier period, reducing the share in the bottom it by 0.12 percentage points per year and expanding the share in the top by the same amount (Panel B third row). Changes in the returns to occupation are not sufficiently influential to warrant reporting in the table.

[20] Unreported results based on the October supplements yield large standard errors, but do indicate that the share of men and women in the bottom wage group grew very slightly as the premium associated with computer use at work rose with time. The effects on shares in all other groups were statistically insignificant, leaving open the question of whether the changing return shifted workers down, or polarized them. Either way, the benefits of the spreading use of computers was much larger, suggesting that overall, computerization caused upward mobility.

[21] We omit one component for the return to states of -0.101.

[22] Were occupation not included as a characteristic, the (reported) figures would be a fall in the share in the botto of 0.33–0.36 and a rise in the share of the top of 0.26–0.32. Compare also with Figure A9.

For men, the joint effects of deunionization and changing industry mix were as detrimental in the earlier period as increasing age and education were beneficial, increasing the share in the bottom group by 0.15 percentage points per year and reducing the share in the top group by 0.13 percentage points per year (Panel B second row). While these effects were not influential for women, the changing return to union status and industry were very influential for the share of women in the bottom group in both periods, reducing it by 0.20–0.21 percentage points per year (Panel C second row).

The substantial effect of the changing return to education in moving workers to the middle two groups is also not well represented in the table (Panel C first row), due to the aggregation with age, whose return does not change in an influential way, and because the change in return to education straddles the two periods . Finally, many of the unexplained components are large, though not all of them are statistically significant (Panel C third row). Only those for 1990 and 2008 are measured at comparable points of the business cycle, however, and the intercept terms from Appendix Tables 1 and 2 column 2 should be used for 1980. These confirm that the largest unexplained components are for the 1980s, tending to increase the shares of men and women in the bottom wage group and women in the top.

7 Conclusion

Focusing on employment by individual wage level rather than by a wage ranking of occupations, we confirm and investigate the declining share of middle-wage employment. Depending on the time period and whether one focuses on men or women, this trend has sometimes reflected upward wage mobility and sometimes reflected downward mobility, but not employment polarization.

Women have achieved strong progress since 1979, with middle-wage jobs giving way to high-wage jobs. Increased age and education have been a strong and steady force for upward mobility of women, leading the shares of women in the bottom and top wage groups to fall and rise, respectively, by at least 0.20 percentage points per year over the study period. Changing returns to characteristics were similarly advantageous for women from 1983 through 2001, but have not contributed to women's upward mobility since then.

The experience of men was quite different. During the 1980s, downward mobility for men was likely driven by deunionization and decline in manufacturing. Together, those

factors increased men's share in the bottom wage group by 0.15 percentage points per year over 1983-90. Subsequently, men began a long, slow period of upward mobility. Changes in labor market returns to characteristics tended to reduce the representation of men in the top wage group, slowing their progress. Throughout 1979-2016, employment shares for men were more sensitive to the business cycle than were shares for women.

We find no evidence of employment polarization, which in our framework would constitute increases in the shares of workers in both the bottom and top wage groups. Oaxaca decompositions of employment share changes show no evidence of any polarizing factor (i.e. changes in characteristics or their returns), nor of any important role for returns to occupations. This suggests that if changes related to returns to occupations or tasks (e.g. computerization) do have a major effect on the wage structure, it is not one that results in employment polarization. Moreover, we find no clear evidence of downward mobility since 2000 of young college graduates, as would have occurred if the computer revolution had matured (Beaudry, Green and Sand 2013).

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Data Appendix

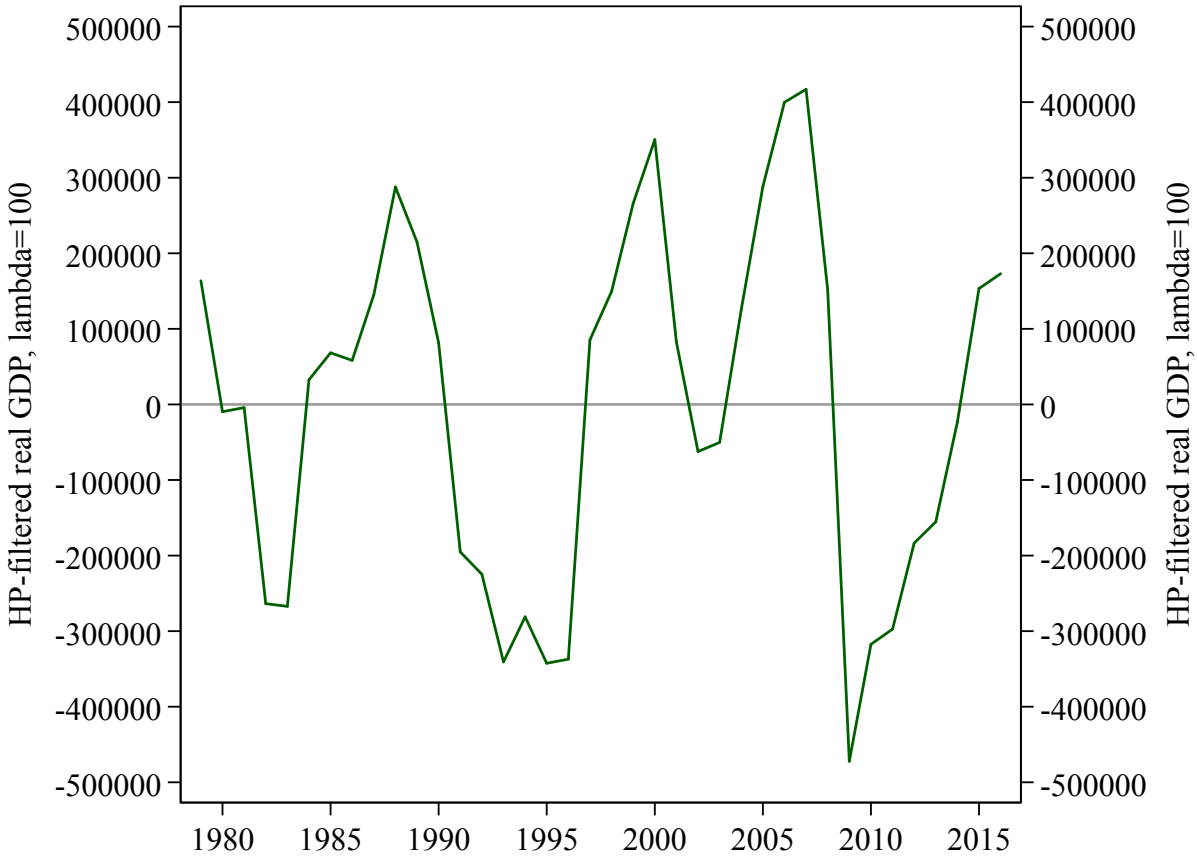
7.1 Harmonization of industry codes

The basis for the harmonization of the industry codes is the aggregate industry codes in the NBER MORG extracts. The NBER itself combines the 1970, 1980 and 1990 codes to generate 48 harmonized aggregate codes, leaving the main task the harmonization of this set of codes with the 2000 aggregate codes. Our general approach is to make the later codes conform to the earlier codes, but we do make some changes to the earlier codes. We reassign those in the 1970–1990 agricultural services category (which does not exist in the 2000 codes) based on their detailed industry code to other professional services (veterinary services), business services (landscaping and horticultural services) or agriculture (other agricultural services). We also split the 1970–1990 retail trade and food services category into two (retail trade, food services). The largest set of changes to the 2000 codes involve the professional and technical services and administrative and support services categories, which crudely correspond to other professional services and business services respectively. However, we reassign specialized design services, computer systems design and related, management, scientific and technical consulting, and advertising and related services from professional and technical services to business services; the aggregate category of membership associations and organizations to other professional services; rental and leasing services from rental/leasing to business services (except video leasing, which is assigned to arts and entertainment); data processing from other information services to business services; travel services from administrative and support services to transportation. We also change the 2000 codes so as to move librarians from other information services to educational services. We merge the 2000 categories (and in some cases 1970–1990 categores) of agriculture and forestry; beverage and tobacco production; petroleum/coal and mining; primary, fabricated and not specified metals; furniture and wood; paper and printing, textiles, apparel and leather; aircrafts and parts, motor vehicles and parts, and transportation equipment; toys/amusements/sporting goods, professional and photographic equipment, miscellaneous manufacturing; accomodation and personal and laundry services; broadcasting, telecommunications, internet publishing and broadcasting and internet services and data provision; paper/printing and publishing; electrical machinery production and computer and electronics production. Some of these merges are done because the more detailed categories are small.

7.2 Harmonization of occupation codes

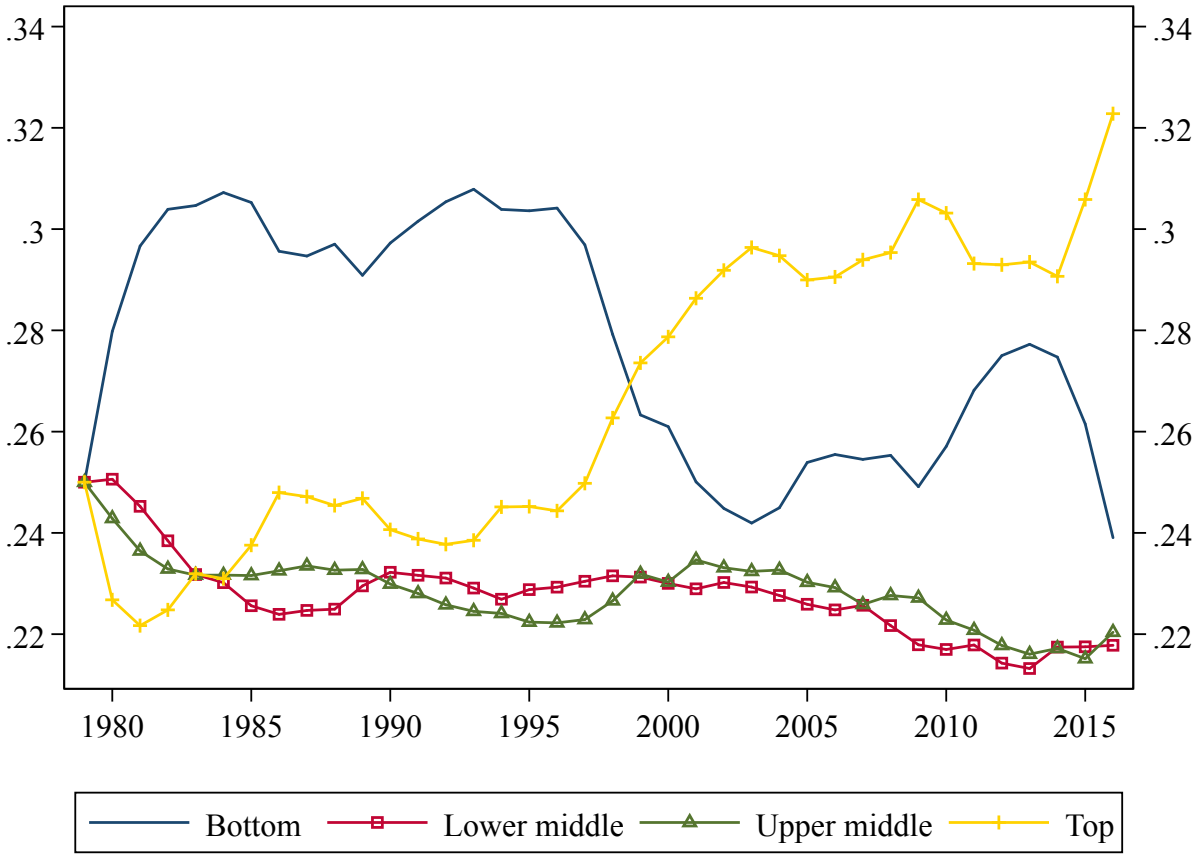
The basis for the coding of occupations is the categories available in the NBER extract covering 2000–2016. For 2002–2016, we use the NBER–assigned aggregate categories available for 2000–2016 ("docc00"). We use the detailed occupation code "occ", available for 1979–2002 to assign occupations for 1979–2002 based on which docc00 code they best correspond to in the overlap years of 2000–2002. In these overlap years, the BLS coded occupations using both old and new categories. The most difficult category to match is the aggregate category Office and Administration Occupations.

Figure 1: HP–filtered real GDP, 1977–2016



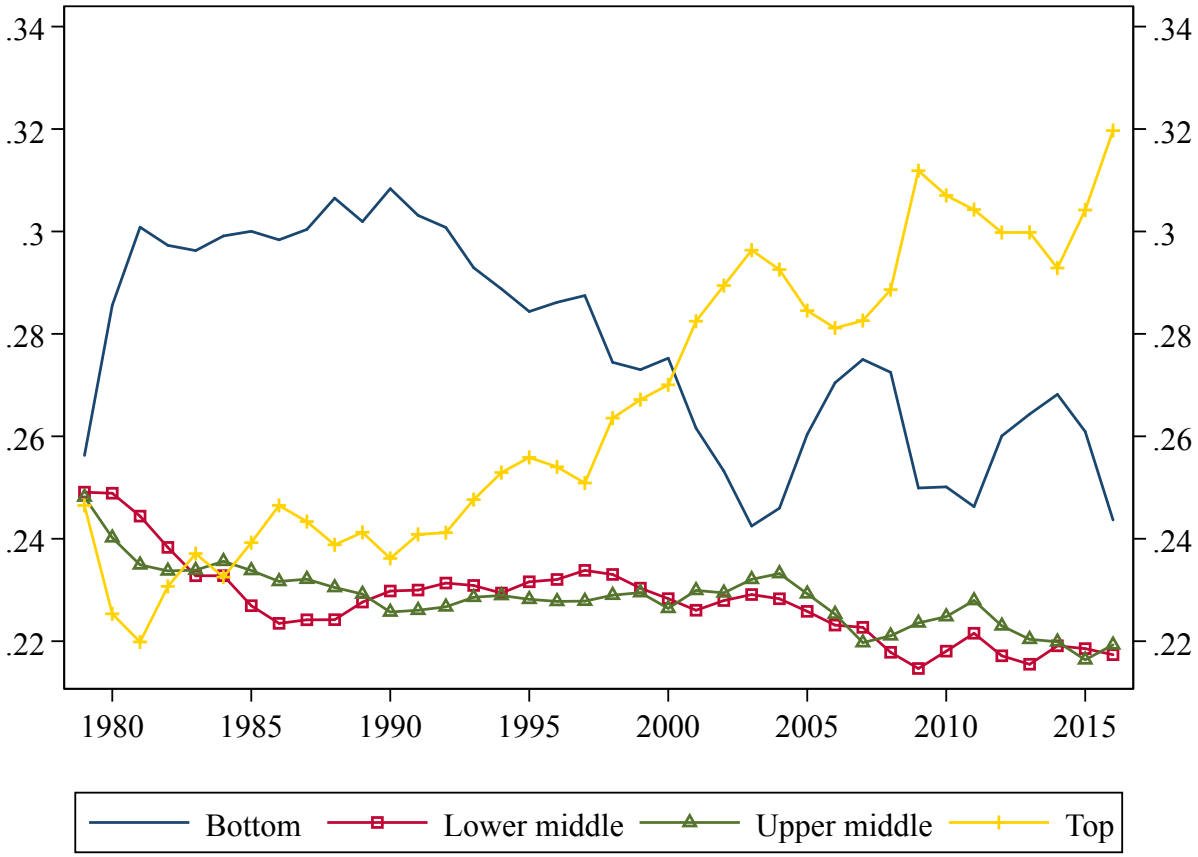
Source: CPS MORGs.

Figure 2: Shares of workers in four wage bins, 1979–2016



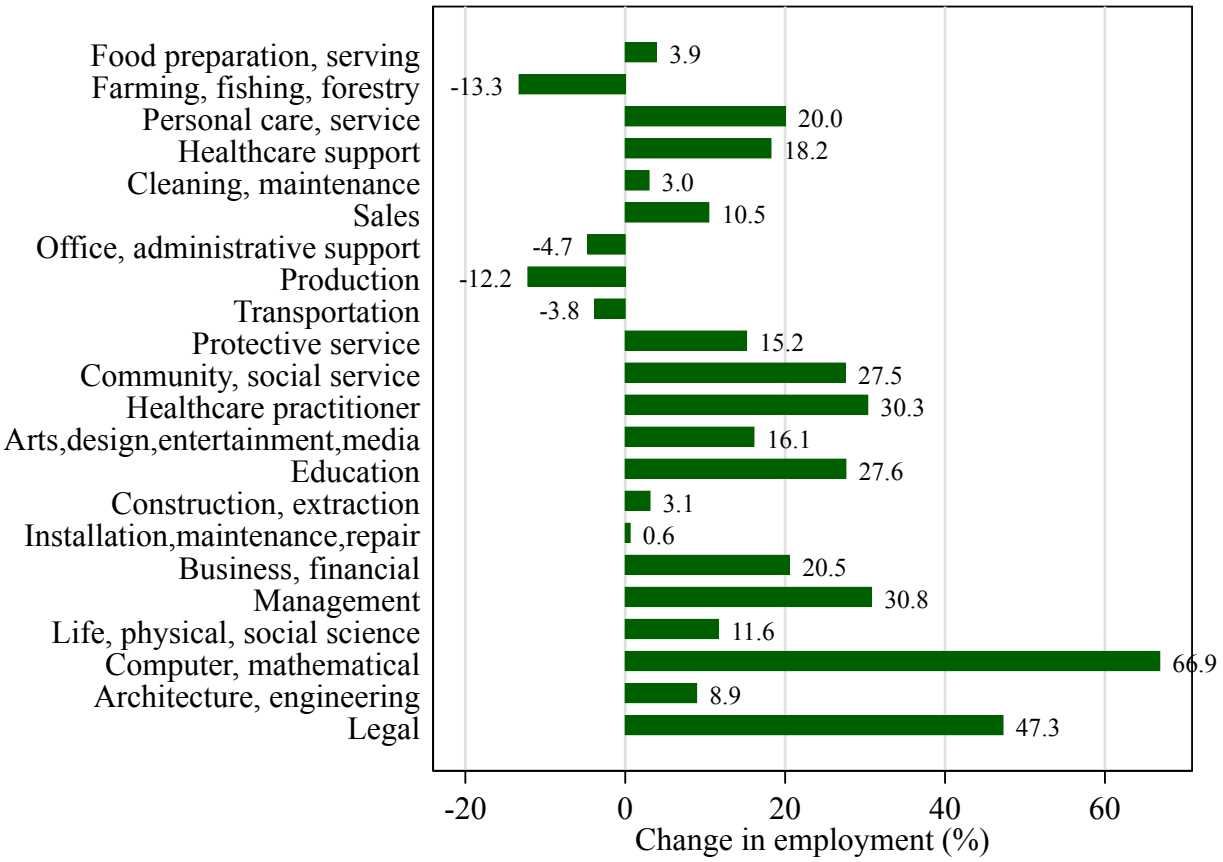
Source: CPS MORGs.

Figure 3: Shares of workers adjusted for HP–filtered GDP, 1979–2016



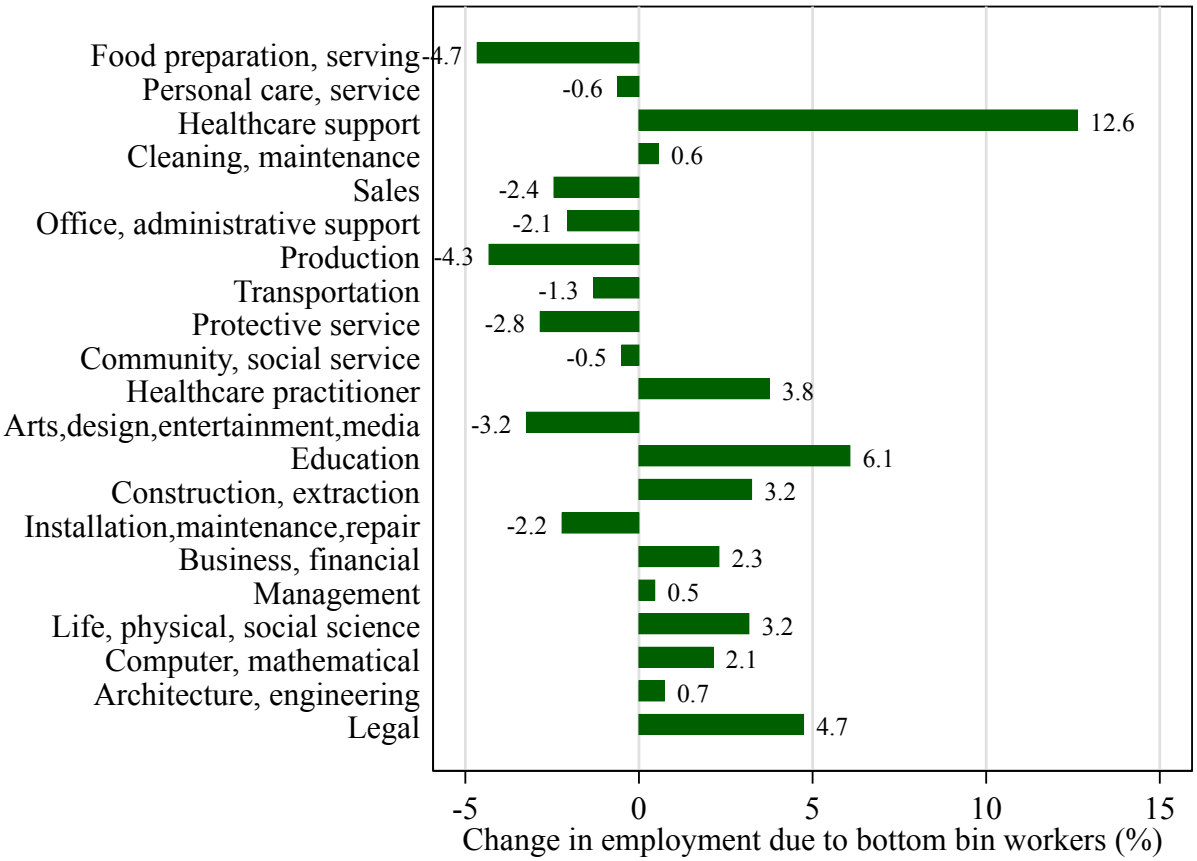
Source: CPS MORGs.

Figure 4: Changes in employment by occupation 1989–1999, ordered by median 1979 wage



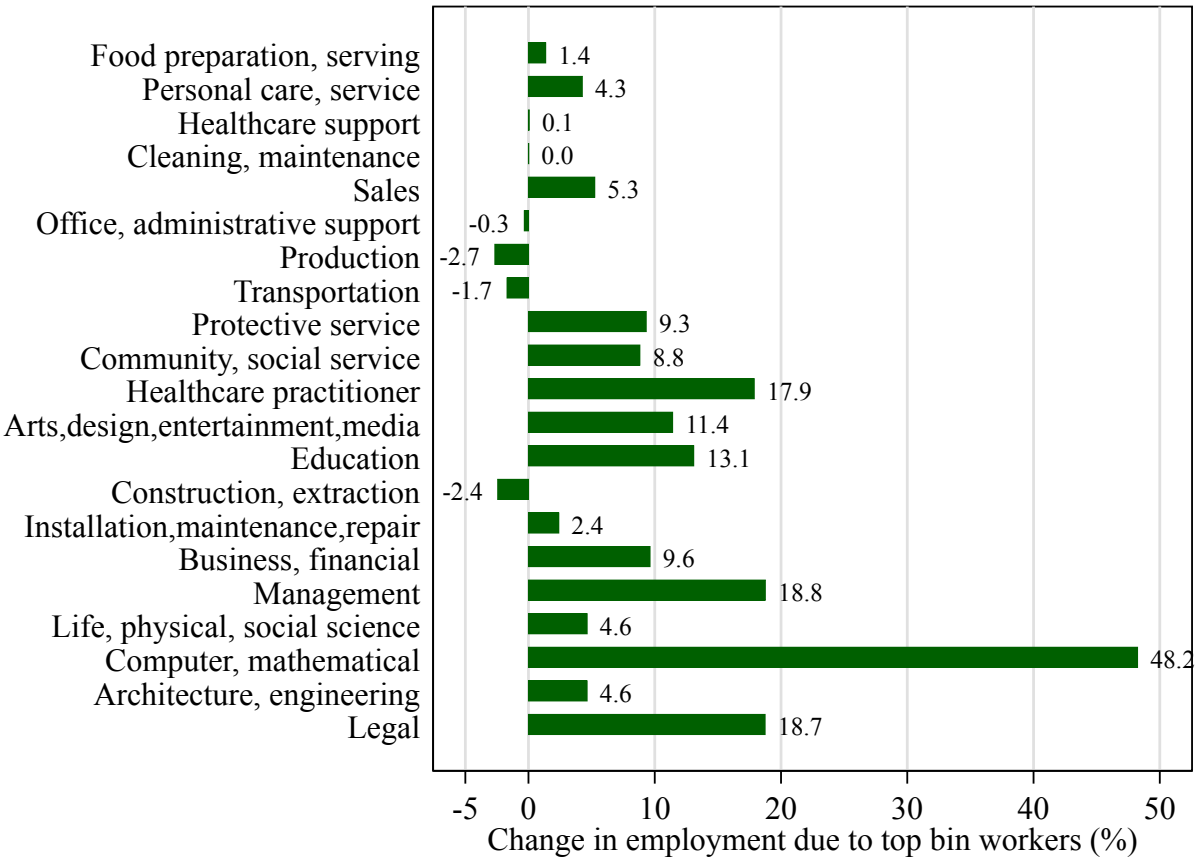
Source: CPS MORGs.

Figure 5: Changes in bottom bin employment by occupation 1989–1999, ordered by median 1979 wage



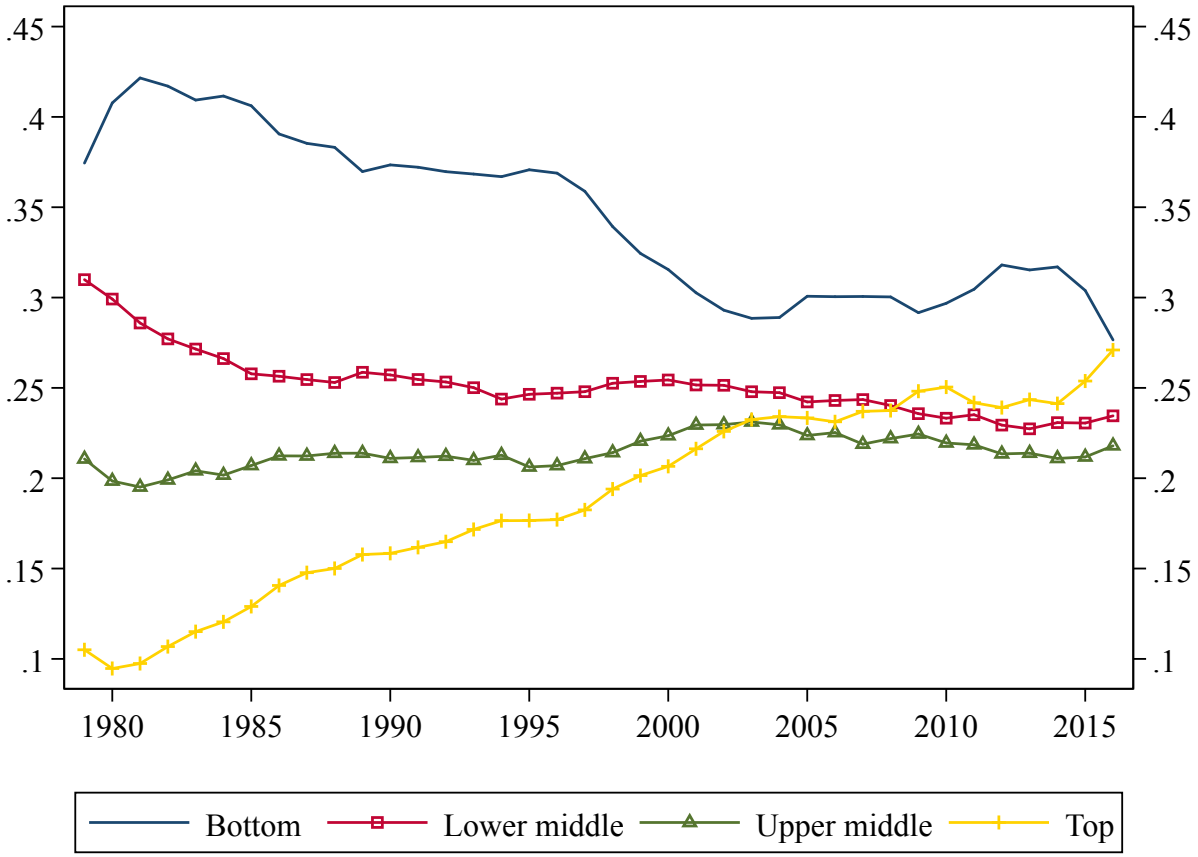
Source: CPS MORGs.

Figure 6: Changes in top bin employment by occupation 1989–1999, ordered by median 1979 wage



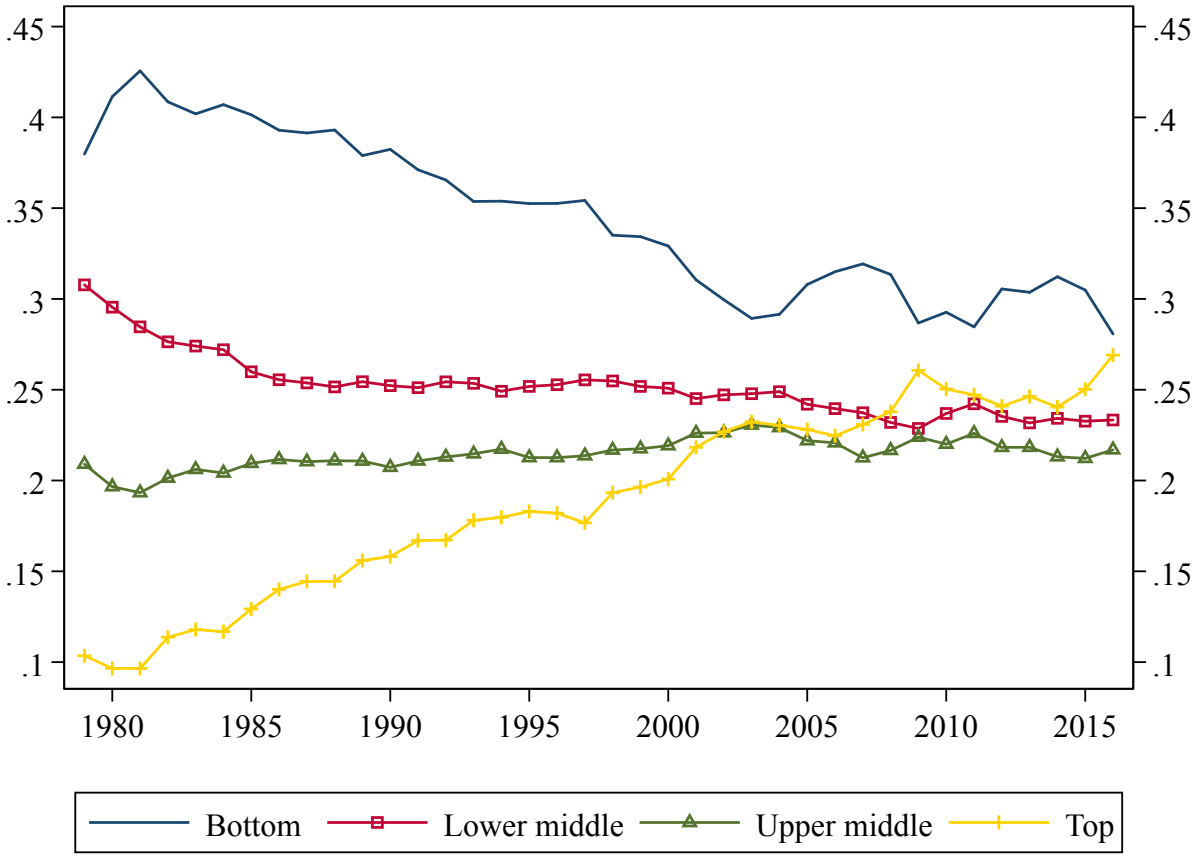
Source: CPS MORGs.

Figure 7: Shares of women in four wage bins, 1979–2016



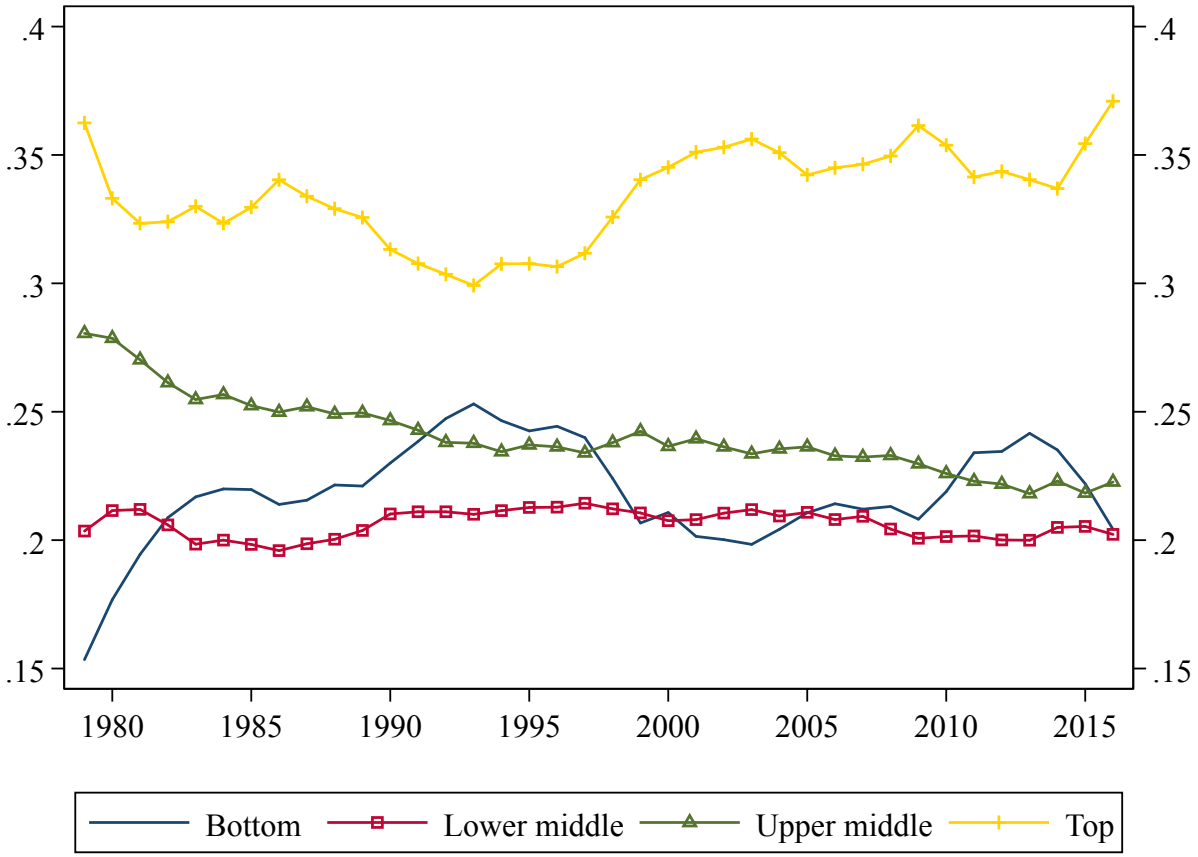
Source: CPS MORGs.

Figure 8: Shares of women adjusted for HP–filtered GDP, 1979–2016



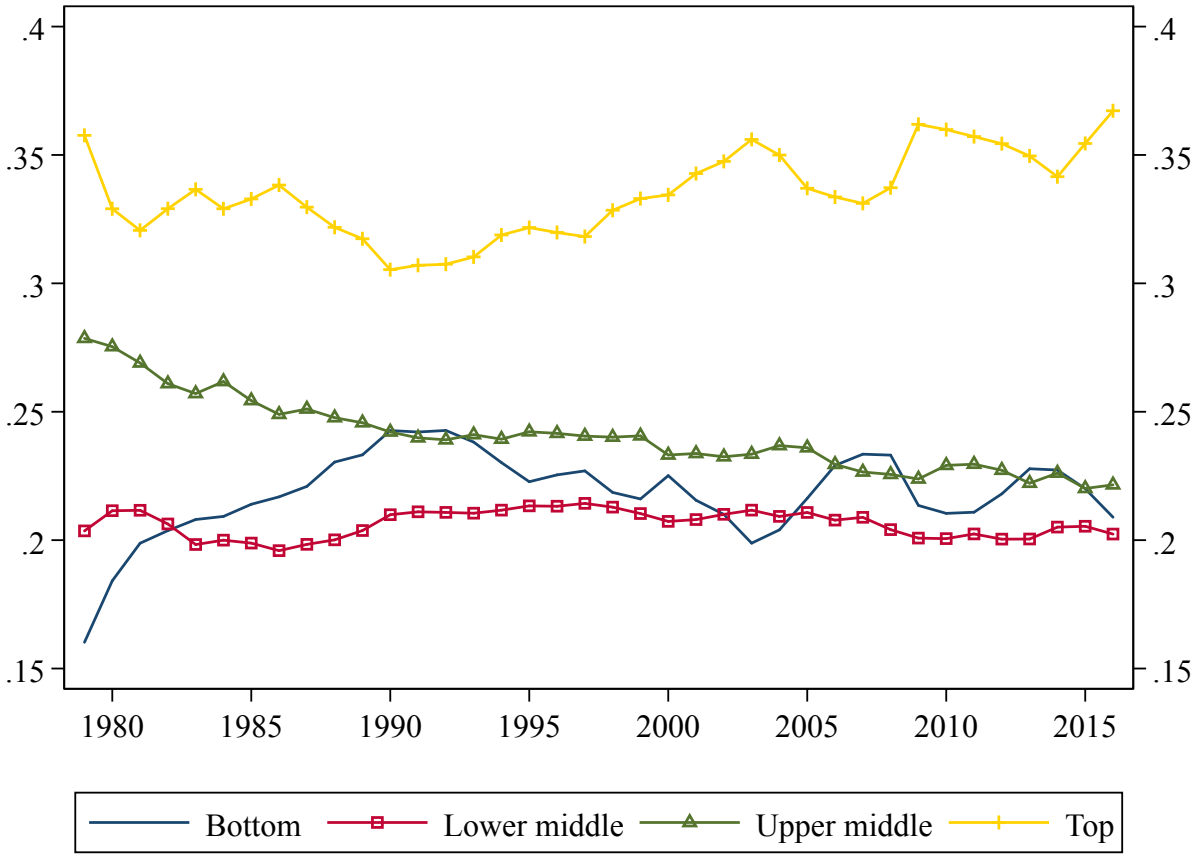
Source: CPS MORGs.

Figure 9: Shares of men in four wage bins, 1979–2016



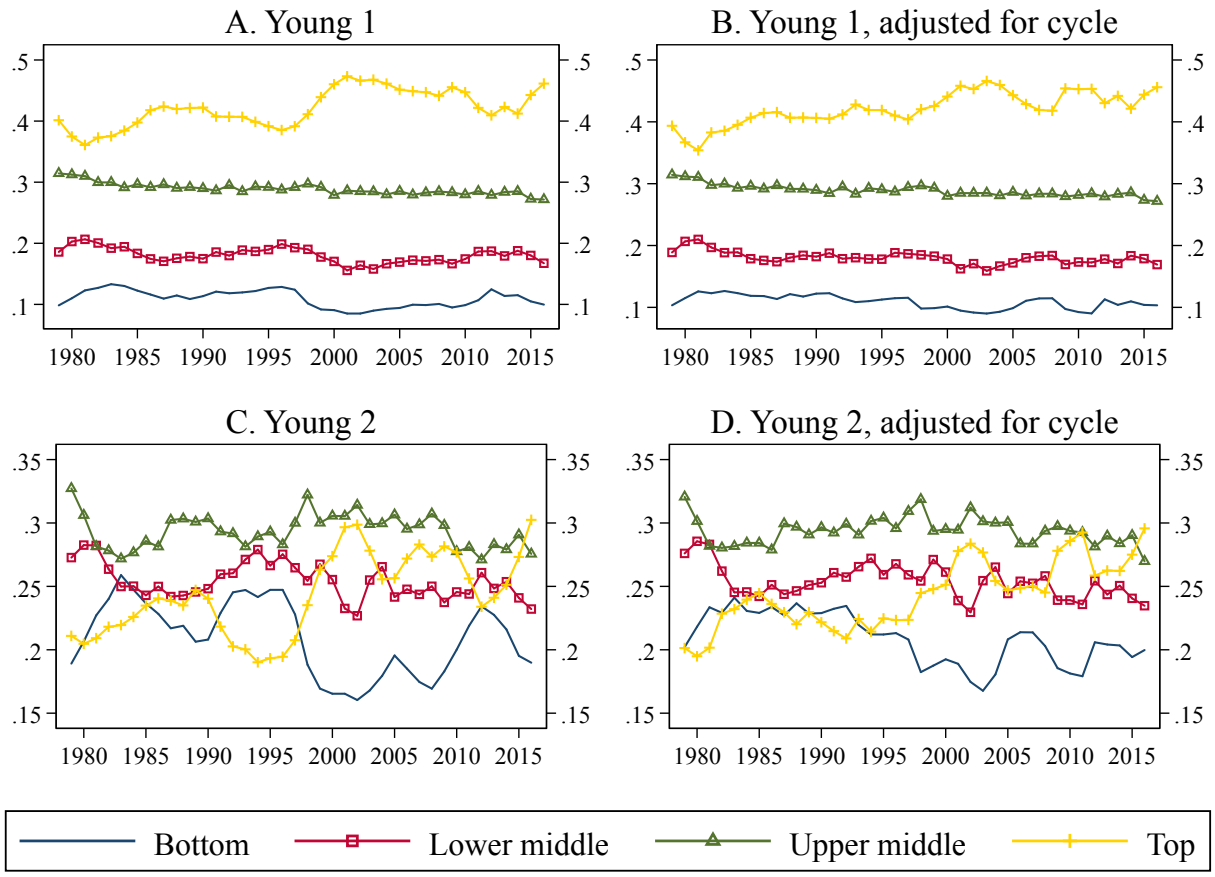
Source: CPS MORGs.

Figure 10: Shares of men adjusted for HP–filtered GDP, 1979–2016



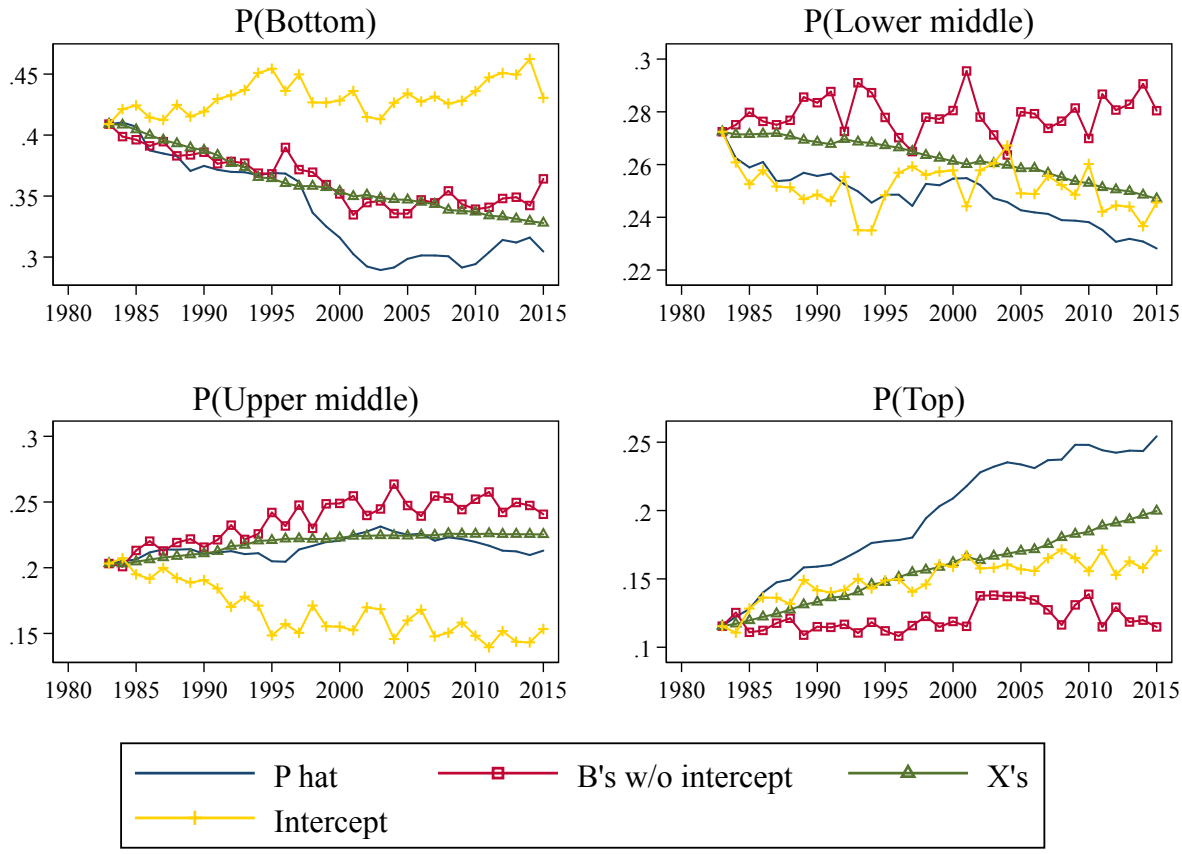
Source: CPS MORGs.

Figure 11: Shares of young college graduates



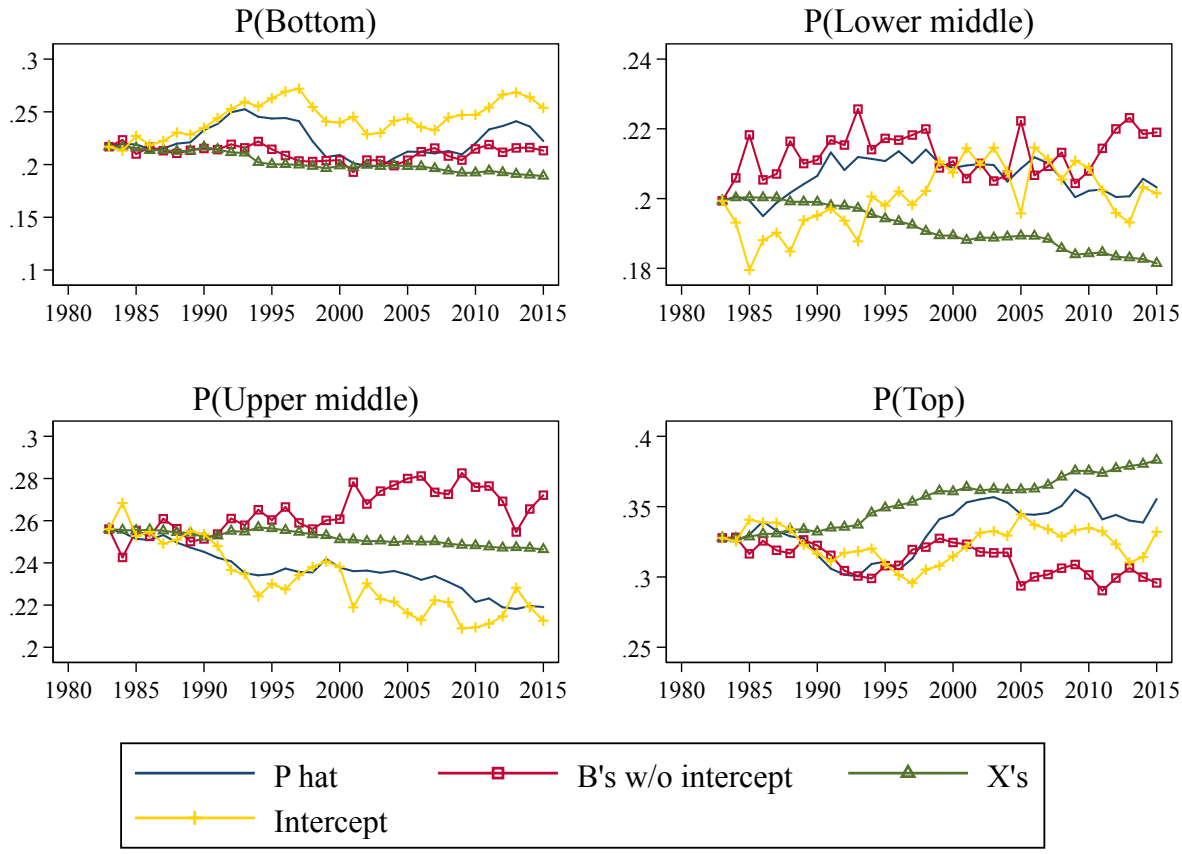
Note: Young 1 refers to college graduates aged 25–25. Young 2 refers to college graduates aged under 30 with 5 or fewer years potential experience.
Source: CPS MORGs.

Figure 12: Predicted shares and their components 1983–2015 – women



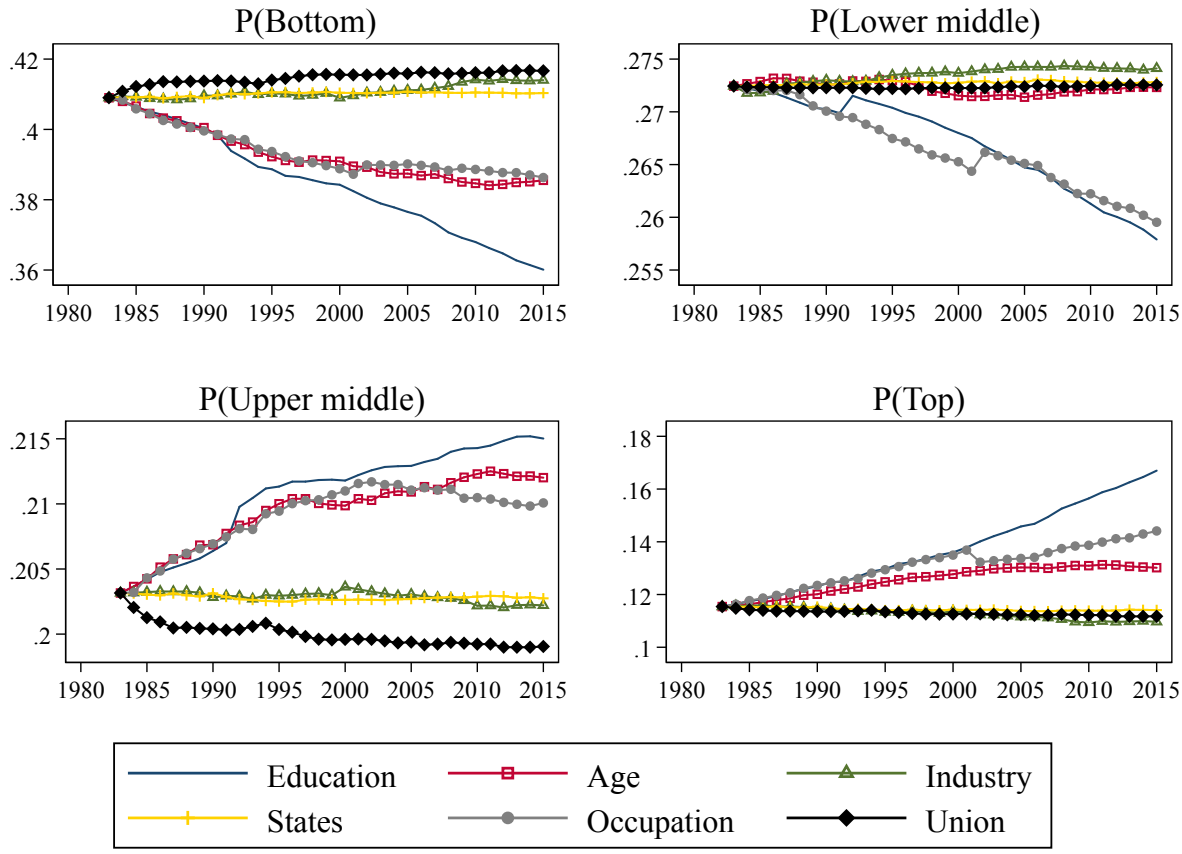
Note: Oaxaca decomposition based on education, age, state, union status, industry and occupation.
Source: CPS MORGs.

Figure 13: Predicted shares and their components 1983–2015 – men



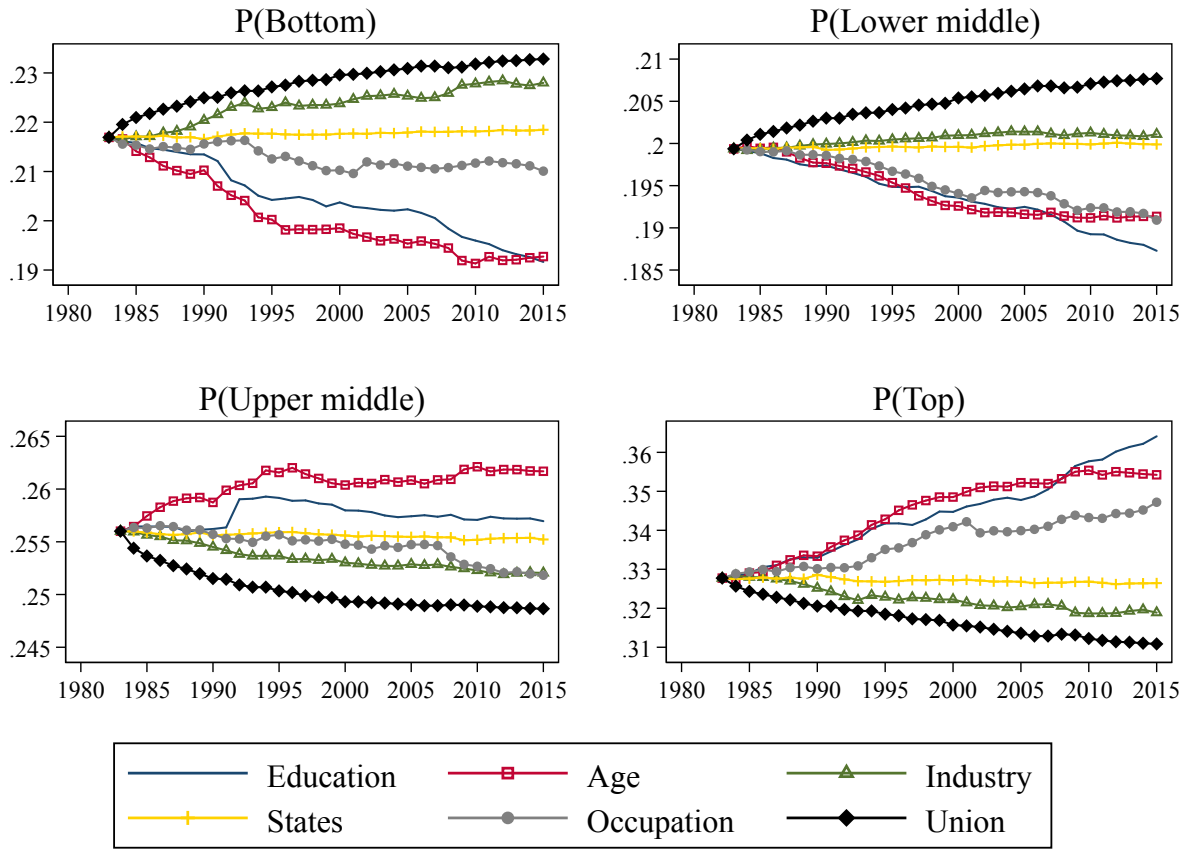
Note: Oaxaca decomposition based on education, age, state, union status, industry and occupation.
Source: CPS MORGs.

Figure 14: Contributions of individual X's 1983–2015 – women



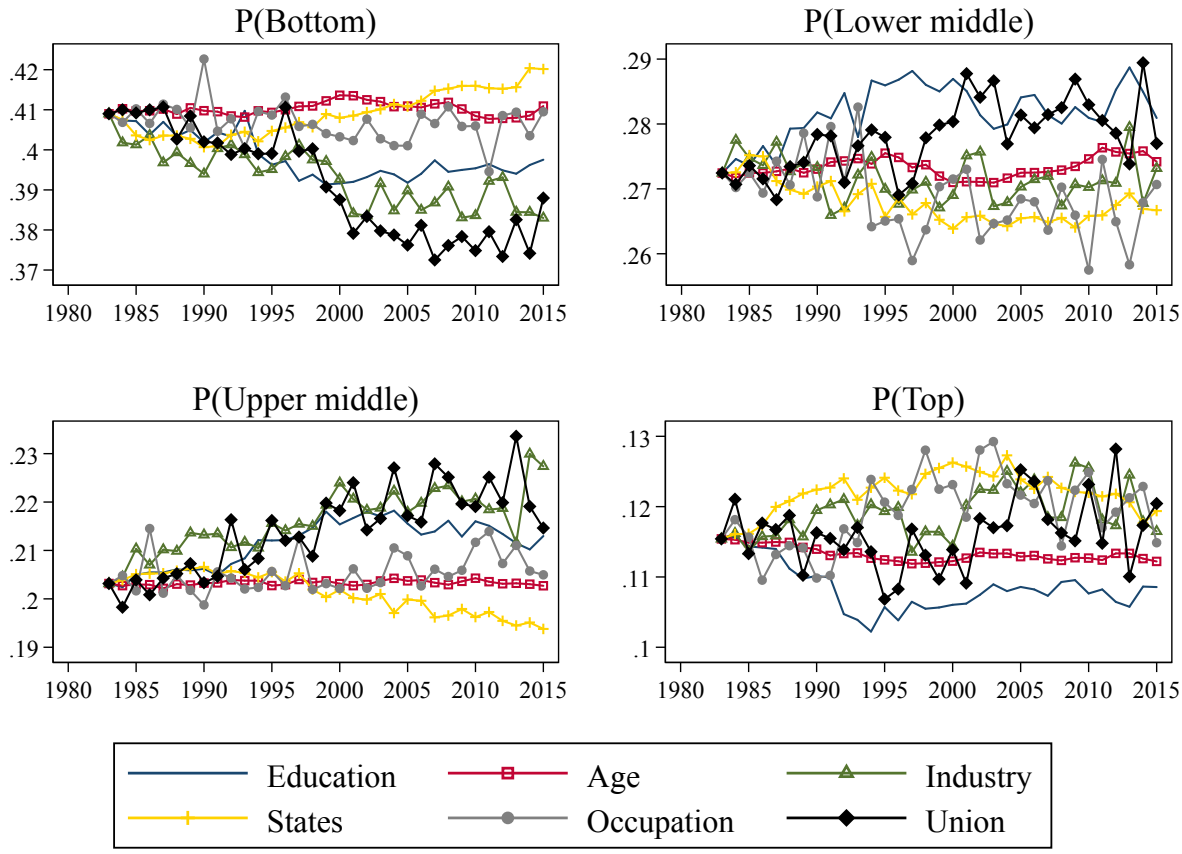
Note: Oaxaca decomposition based on education, age, state, union status, industry and occupation.
Source: CPS MORGs.

Figure 15: Contributions of individual X's 1983–2015 – men



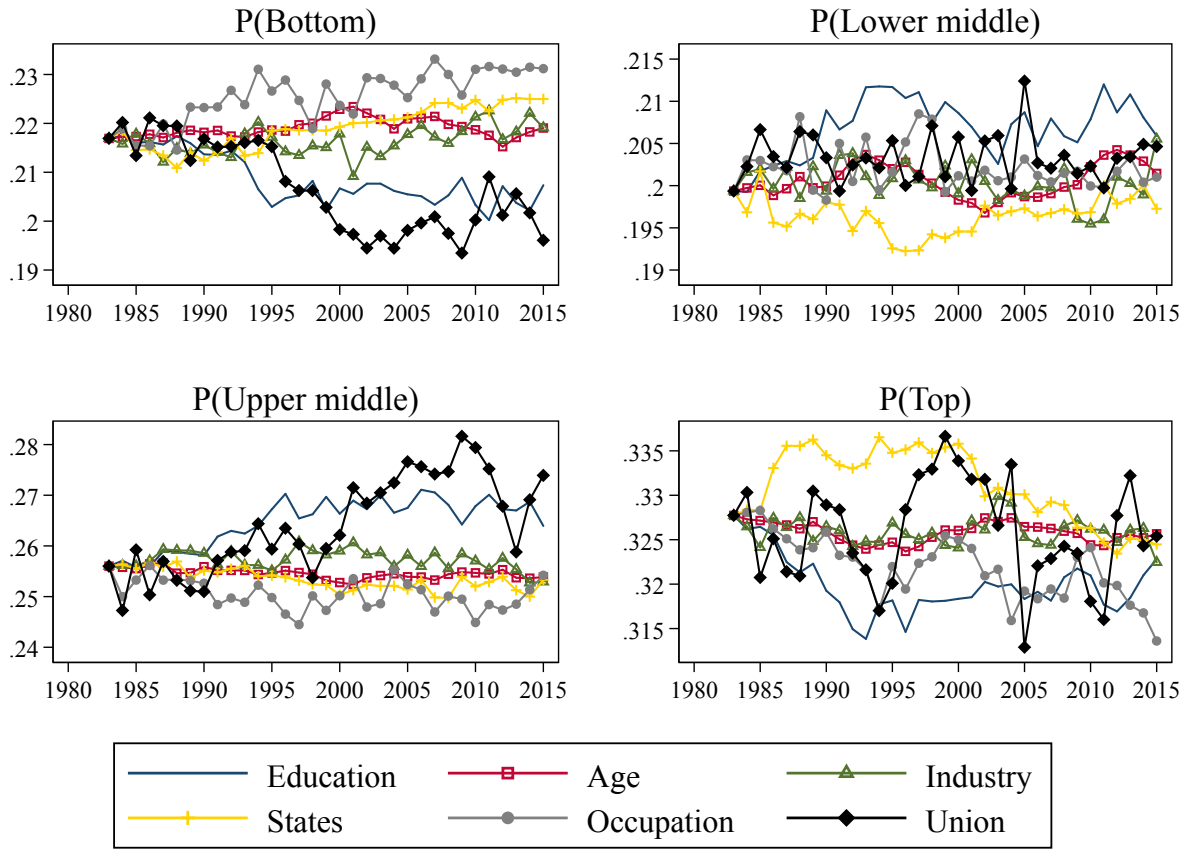
Note: Oaxaca decomposition based on education, age, state, union status, industry and occupation.
Source: CPS MORGs.

Figure 16: Contributions of individual β's 1983–2015 – women



Note: Oaxaca decomposition based on education, age, state, union status, industry and occupation.
Source: CPS MORGs.

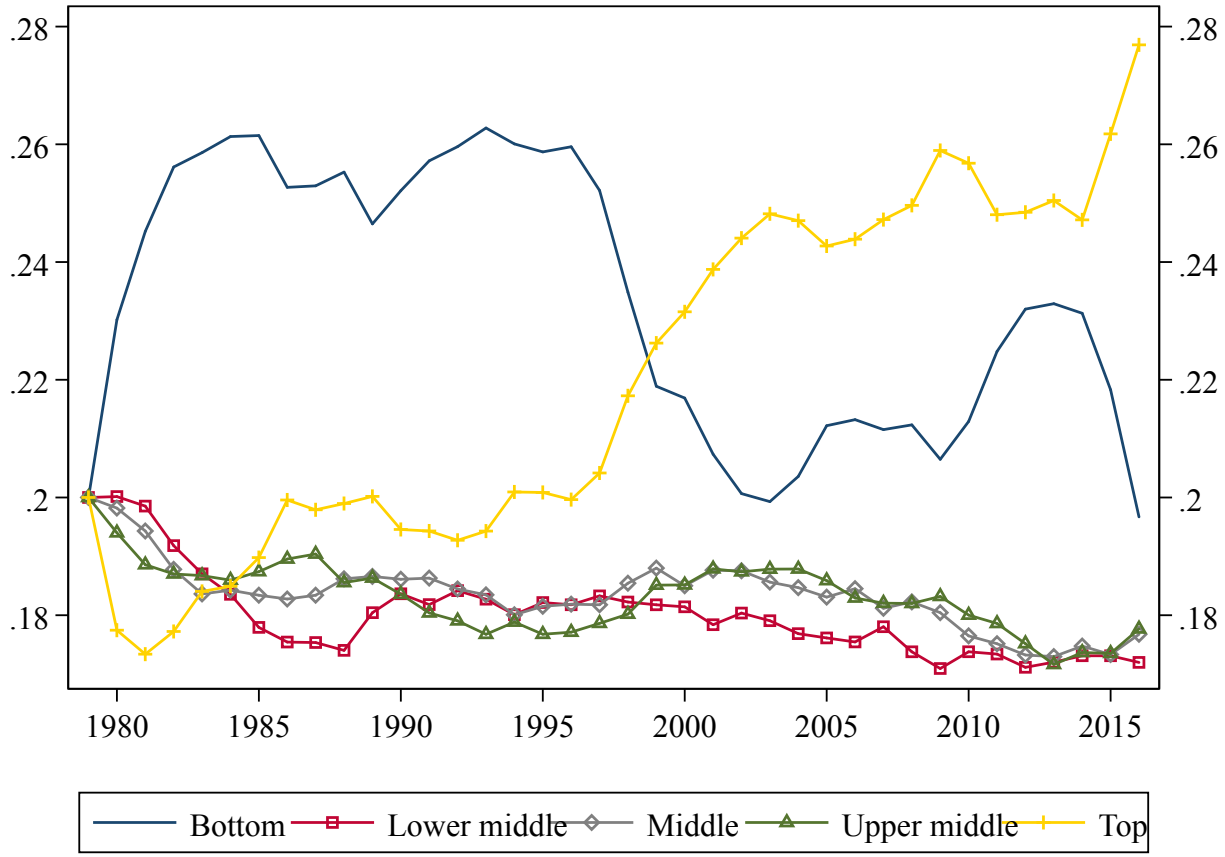
Figure 17: Contributions of individual β's 1983–2015 – men



Note: Oaxaca decomposition based on education, age, state, union status, industry and occupation.
Source: CPS MORGs.

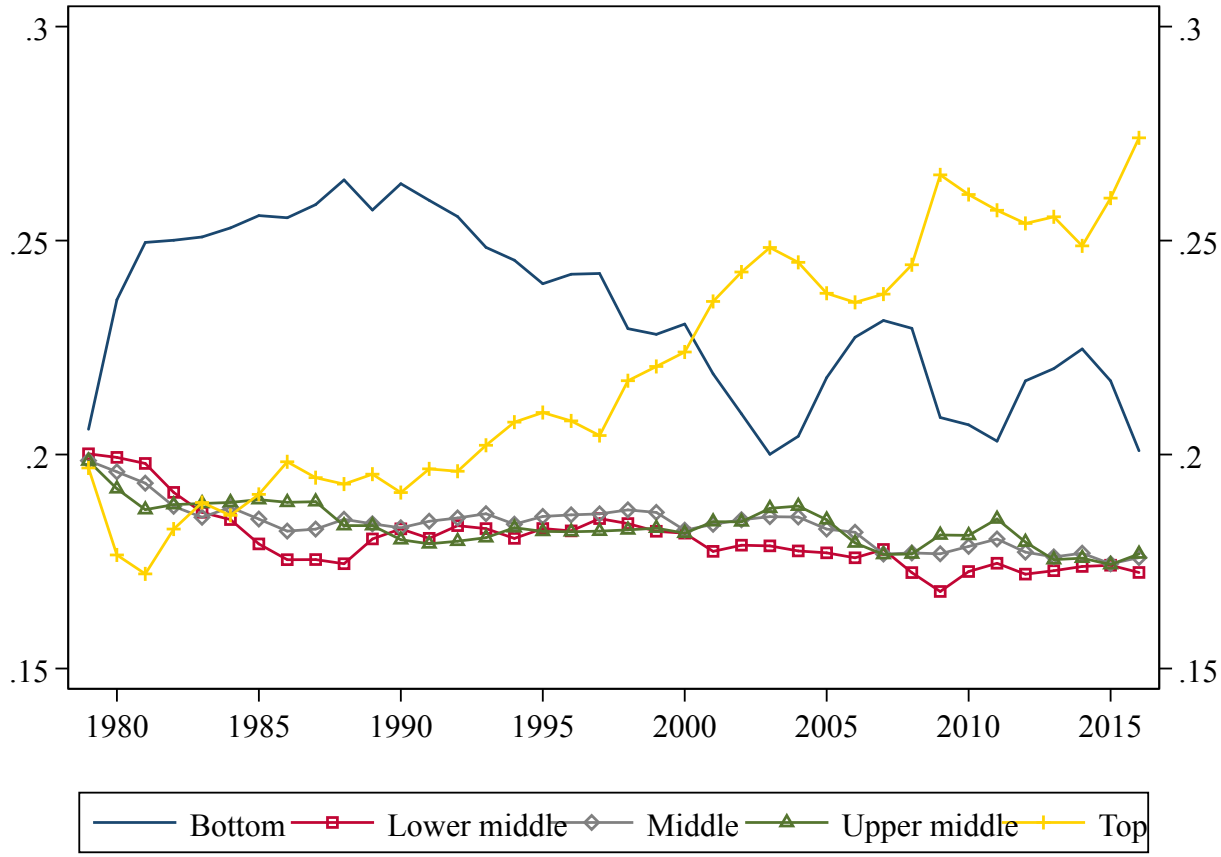
	Women				Men			
	1983-1990		1990-2008		1983-1990		1990-2008	
	Bottom	Top	Bottom	Top	Bottom	Top	Bottom	Top
ΔP	**-0.640**	**0.622**	**-0.368**	**0.435**	**0.225**	**-0.174**	**-0.110**	**0.194**
	(0.041)	**(0.024)**	**(0.013)**	**(0.011)**	**(0.028)**	**(0.032)**	**(0.011)**	**(0.013)**
ΔX								
Age+edu	**-0.279**	**0.199**	**-0.251**	**0.238**	**-0.158**	**0.148**	**-0.191**	**0.227**
	(0.011)	**(0.022)**	**(0.006)**	**(0.006)**	**(0.010)**	**(0.011)**	**(0.005)**	**(0.006)**
Union+ industry	--	--	--	--	**0.154**	**-0.127**	--	--
					(0.008)	**(0.007)**		
Occ	**-0.123**	**0.116**	--	--	--	--	--	--
	(0.009)	**(0.006)**						
Δβ								
Age+edu	--	**-0.118**	--	--	--	**-0.138**	--	--
		(0.022)				**(0.019)**		
Union+ industry	**-0.210**	--	**-0.202**	--	--	--	--	--
	(0.089)		**(0.033)**					
Constant	**0.103**	**0.375**	--	**0.165**	**0.253**	**-0.159**	--	--
	(0.129)	**(0.081)**		**(0.040)**	**(0.078)**	**(0.088)**		
Obs	156,290	160,735	157,128	161,573	178,859		168,422	

Figure A1: Shares of men and women in five wage bins, 1979–2016



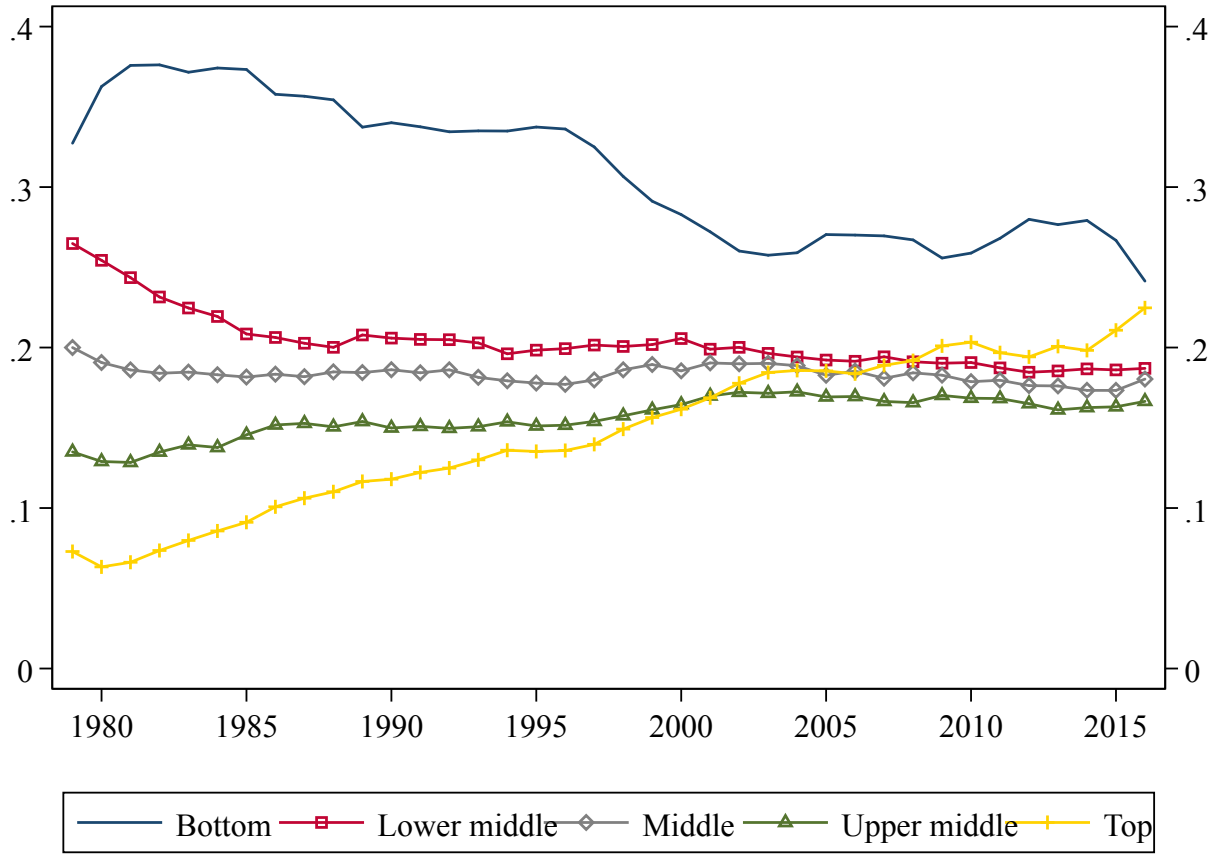
Source: CPS MORGs.

Figure A2: Shares of men and women in five wage bins, 1979–2016



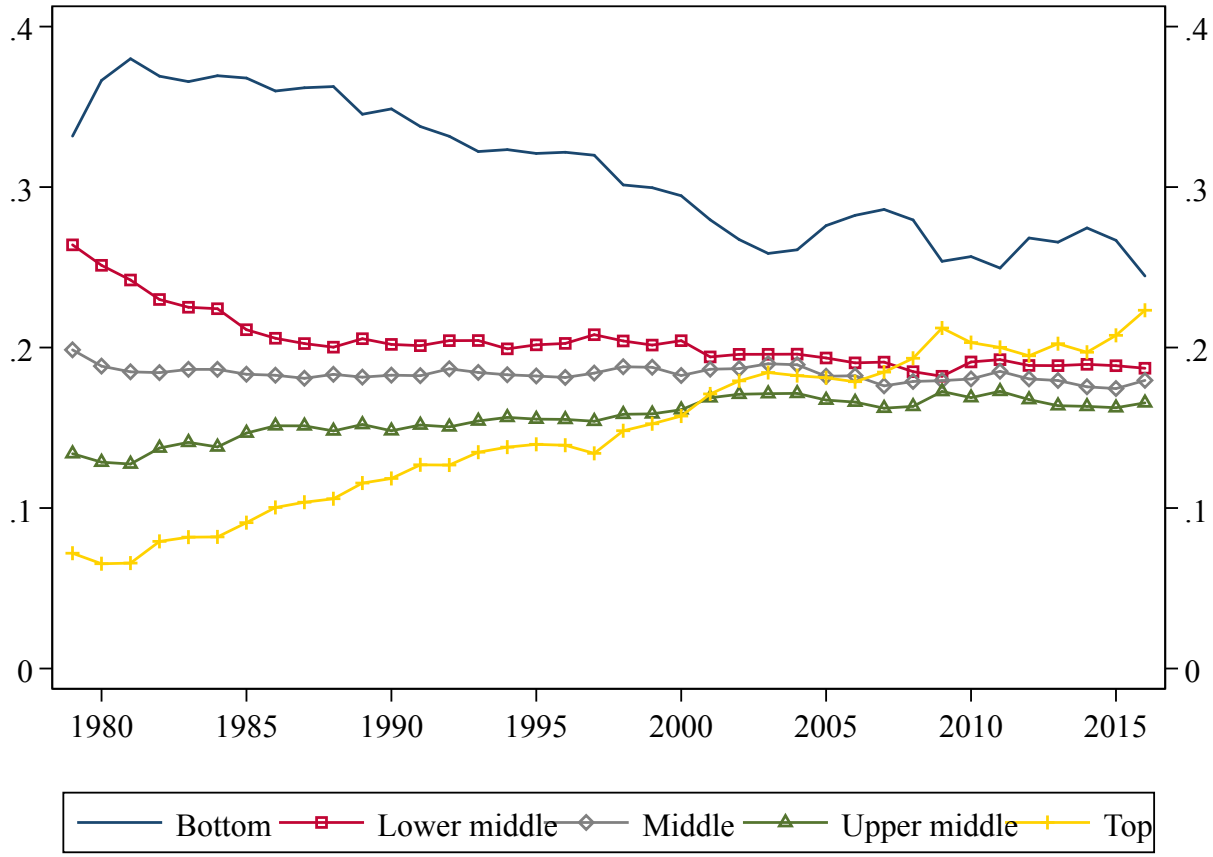
Source: CPS MORGs.

Figure A3: Shares of women in five wage bins, 1979–2016



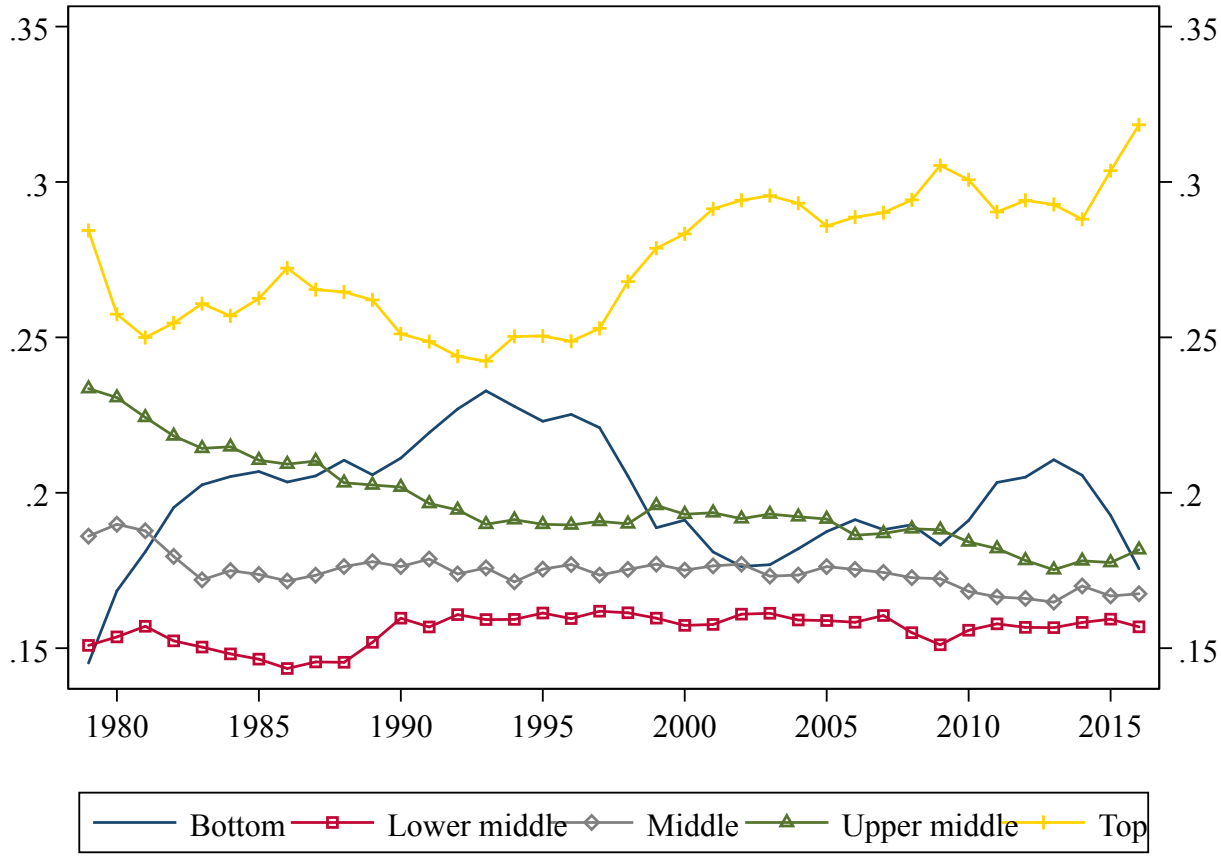
Source: CPS MORGs.

Figure A4: Shares of women in five wage bins, adjusted for cycle, 1979–2016



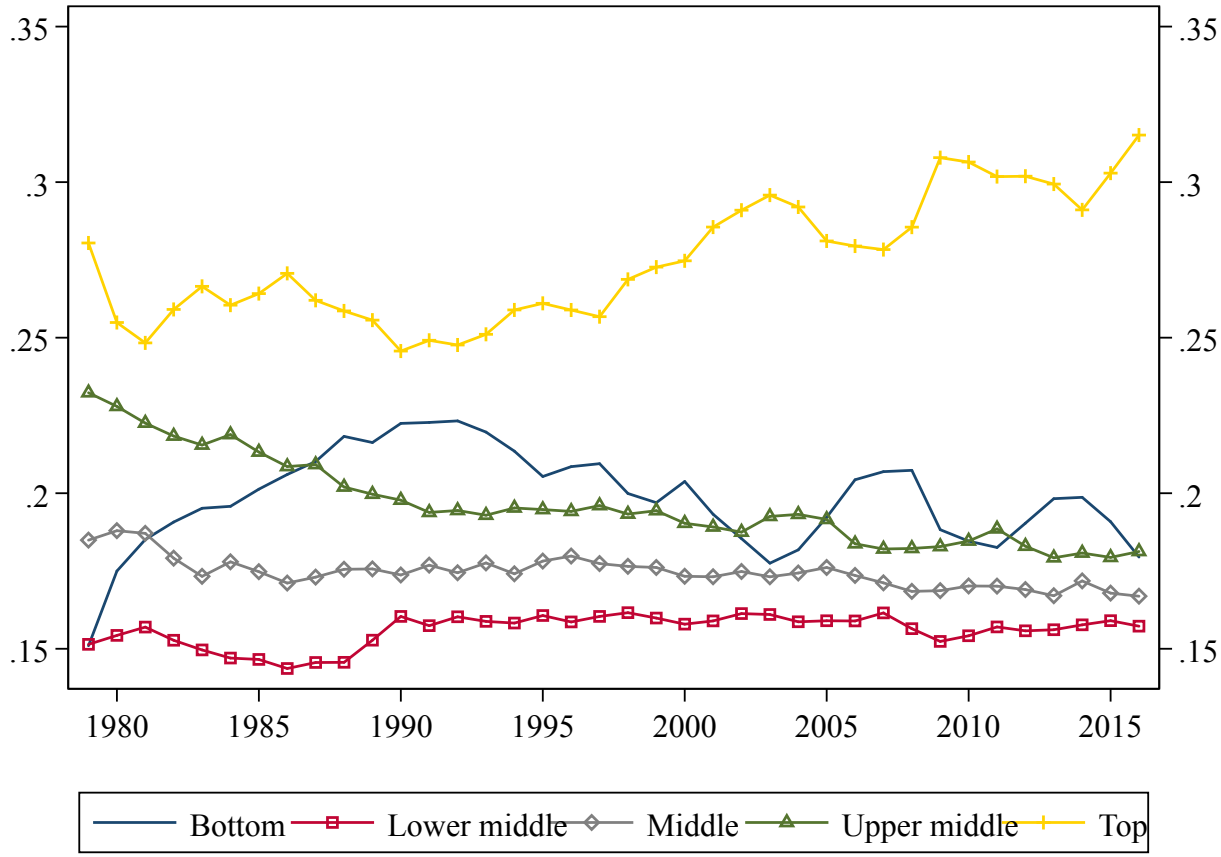
Source: CPS MORGs.

Figure A5: Shares of men in five wage bins, 1979–2016



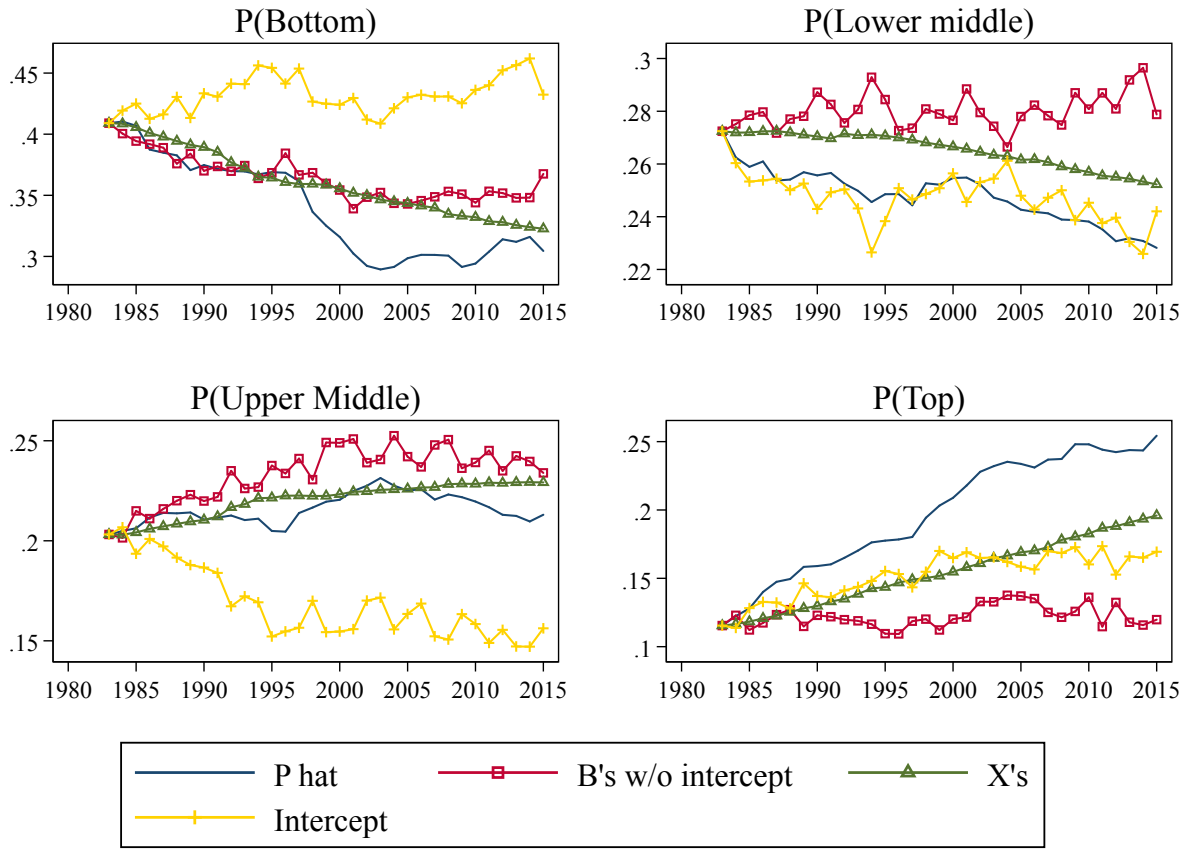
Source: CPS MORGs.

Figure A6: Shares of men in five wage bins, adjusted for cycle, 1979–2016



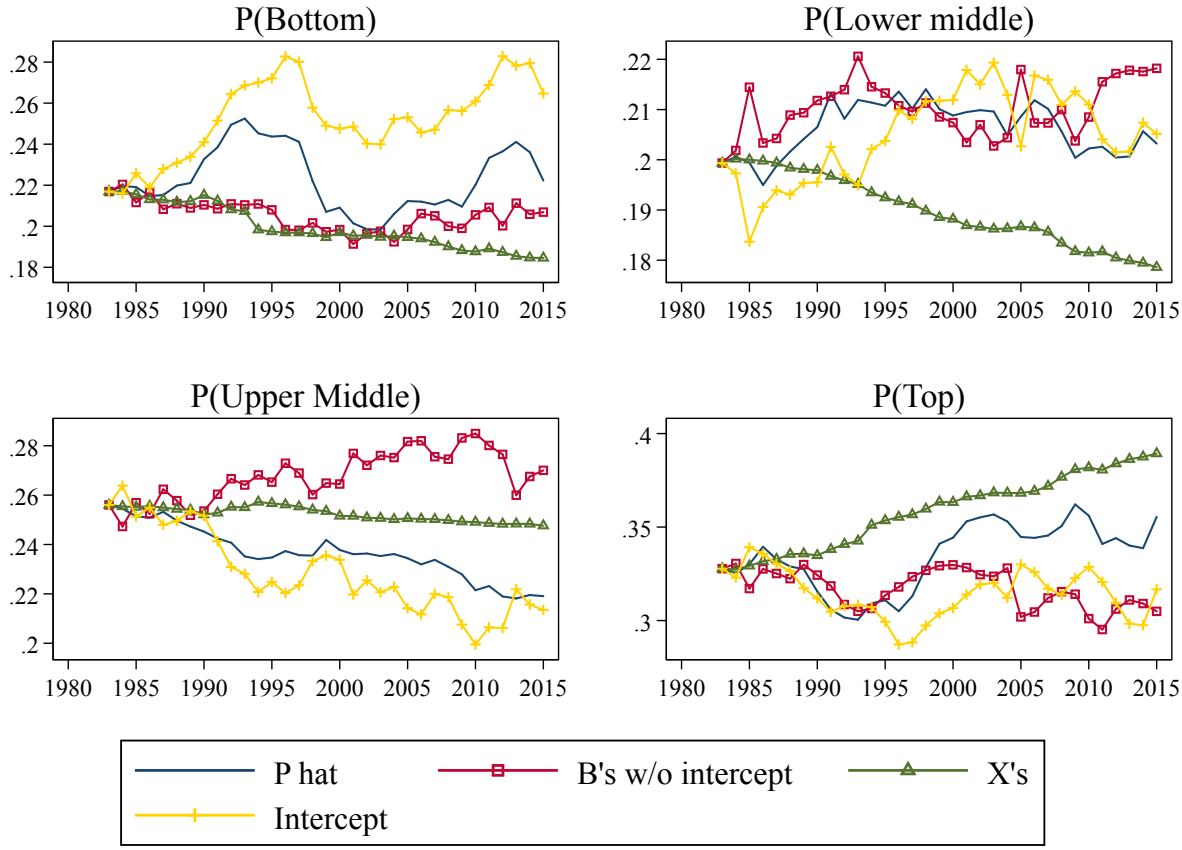
Source: CPS MORGs.

Figure A7: Predicted shares and their components without occupation 1983–2015 – women



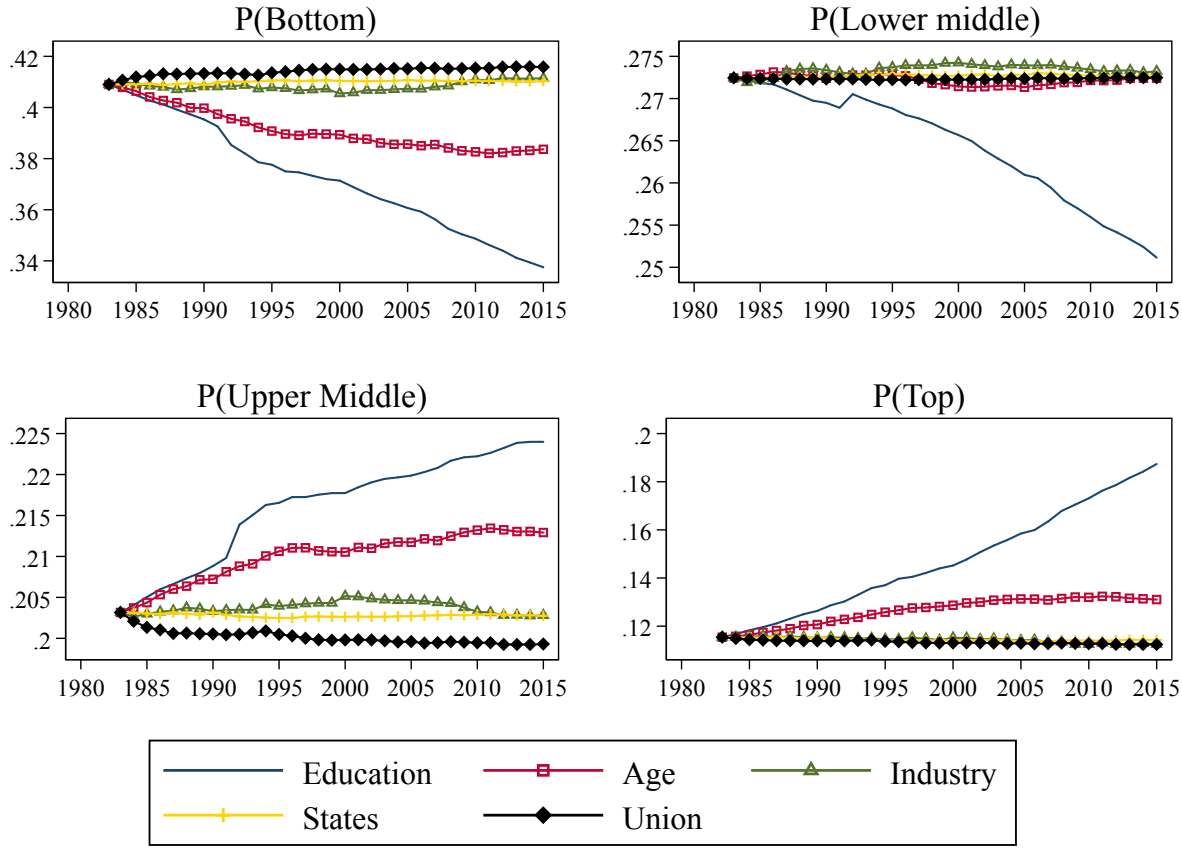
Note: Oaxaca decomposition based on education, age, state, union status, and industry.
Source: CPS MORGs.

Figure A8: Predicted shares and their components without occupation 1983–2015 – men



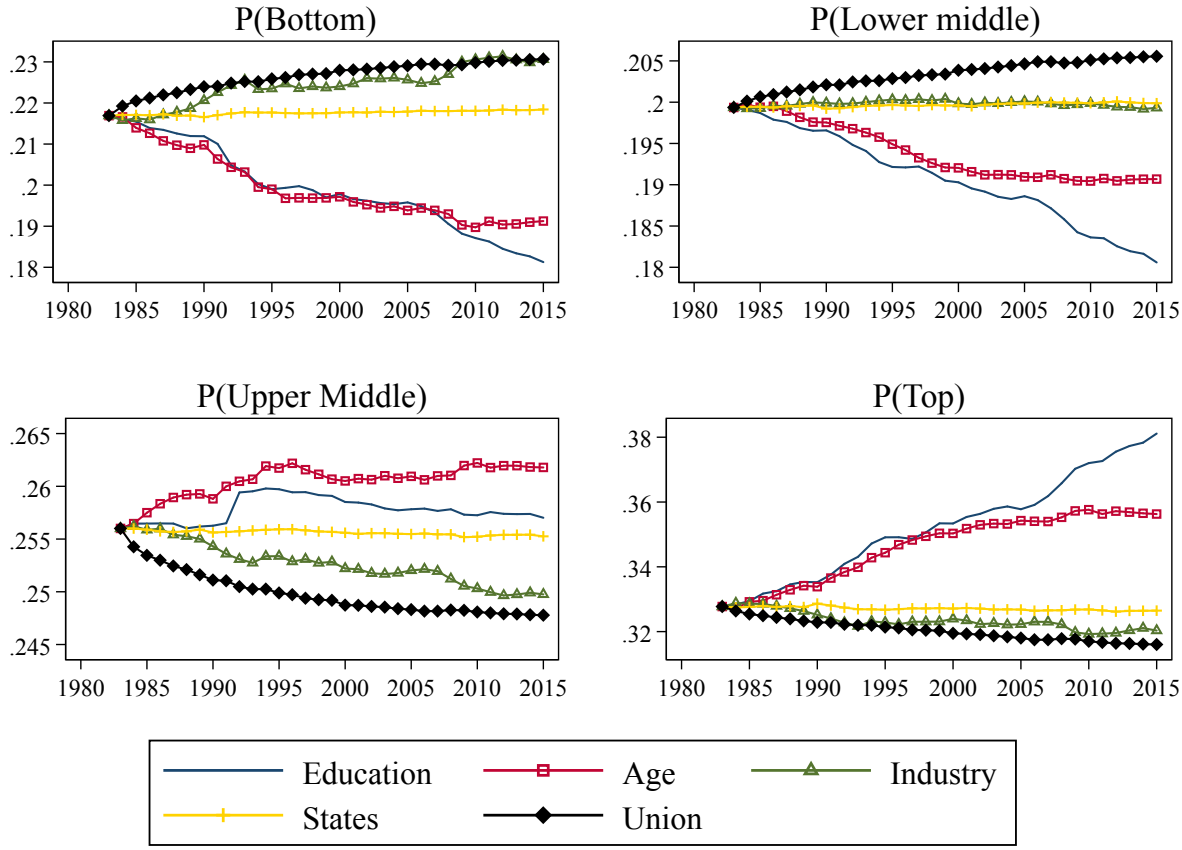
Note: Oaxaca decomposition based on education, age, state, union status, and industry.
Source: CPS MORGs.

Figure A9: Contributions of individual X's without occupation 1983–2015 – women



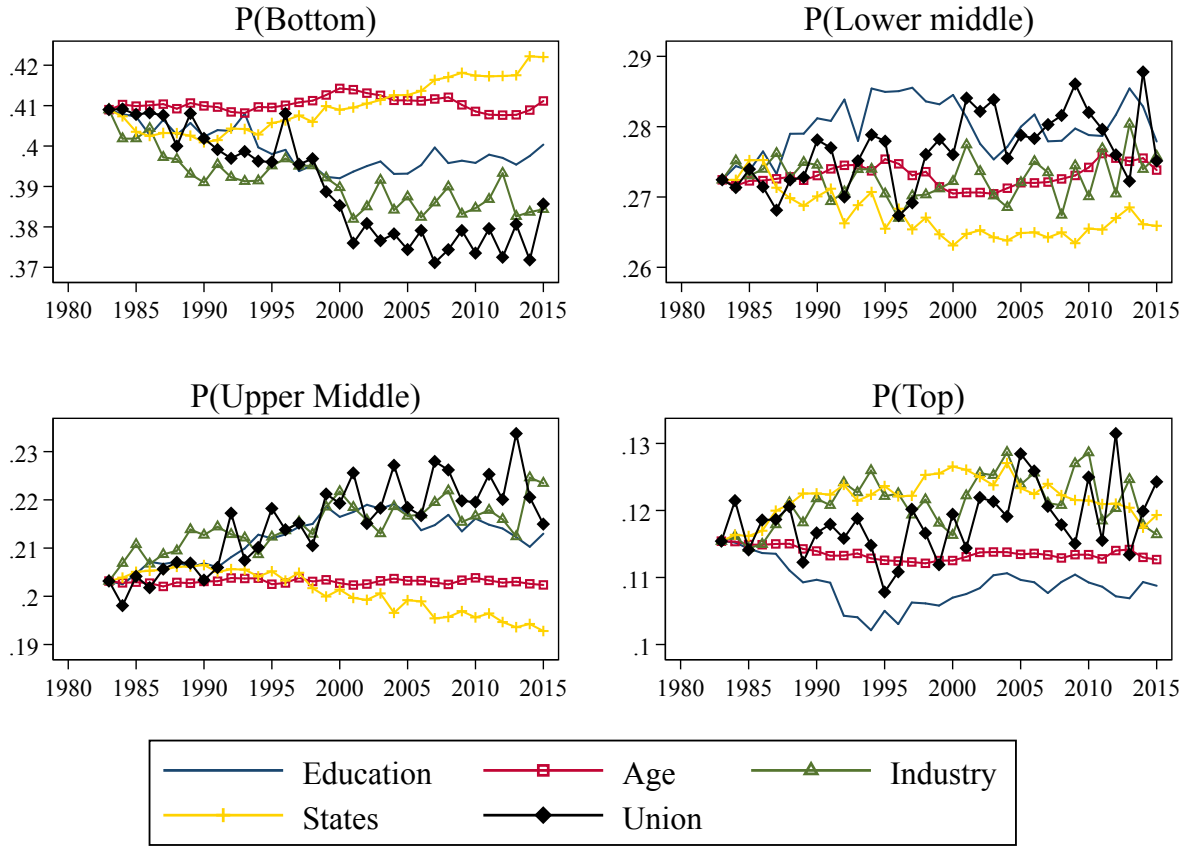
Note: Oaxaca decomposition based on education, age, state, union status, and industry.
Source: CPS MORGs.

Figure A10: Contributions of individual X's without occupation 1983–2015 – men



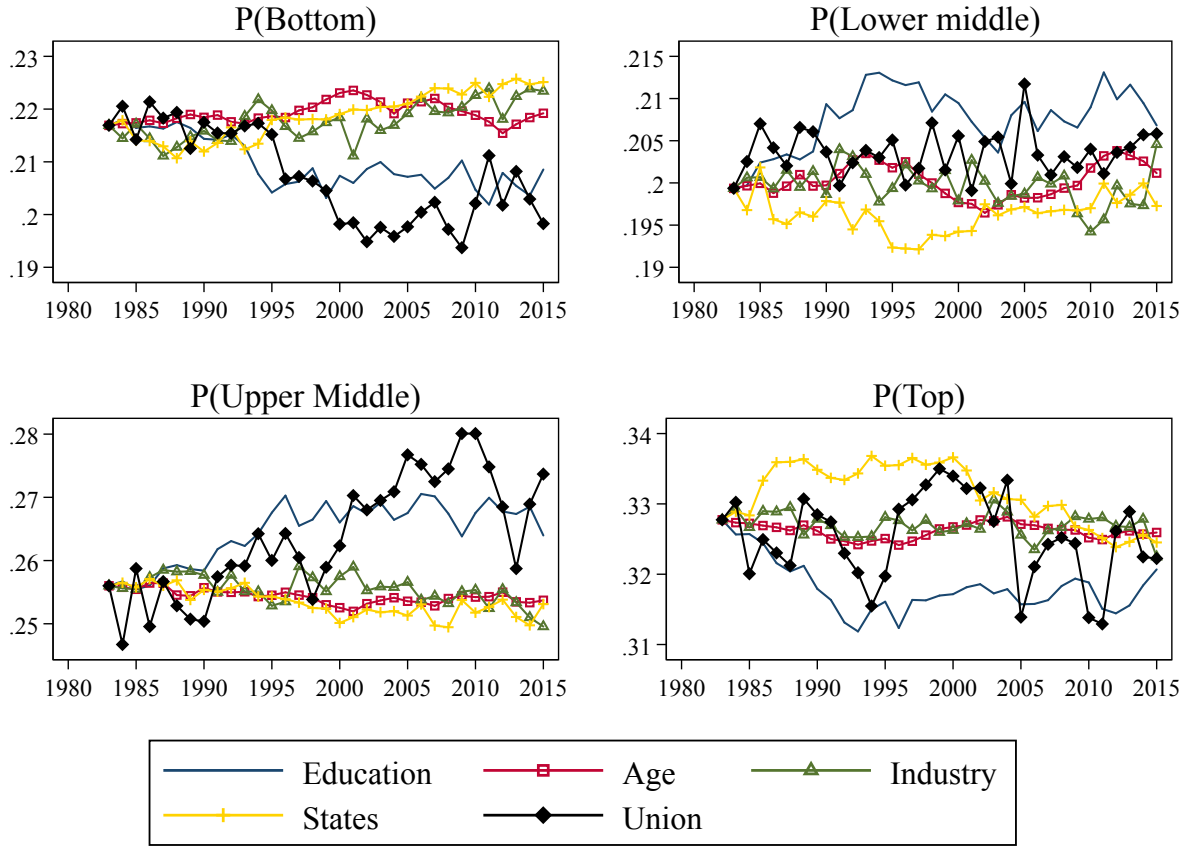
Note: Oaxaca decomposition based on education, age, state, union status, and industry.
Source: CPS MORGs.

Figure A11: Contributions of individual β's without occupation 1983–2015 – women



Note: Oaxaca decomposition based on education, age, state, union status, and industry.
Source: CPS MORGs.

Figure A12: Contributions of individual β's without occupation 1983–2015 – men



Note: Oaxaca decomposition based on education, age, state, union status, and industry.
Source: CPS MORGs.

Appendix Table 1: Means of age, school and union status

	Women				Men			
	1980	1983	1990	2008	1980	1983	1990	2008
Age 18-20	0.092	0.080	0.067	0.045	0.080	0.069	0.064	0.045
Age 21-24	0.132	0.134	0.105	0.088	0.124	0.125	0.106	0.088
Age 25-29	0.153	0.163	0.151	0.120	0.153	0.164	0.158	0.128
Age 30-34	0.138	0.142	0.151	0.109	0.146	0.149	0.158	0.119
Age 35-39	0.114	0.122	0.141	0.116	0.110	0.124	0.141	0.124
Age 40-44	0.097	0.101	0.130	0.122	0.087	0.099	0.122	0.124
Age 45-49	0.087	0.081	0.097	0.132	0.085	0.081	0.090	0.127
Age 50-54	0.077	0.073	0.070	0.120	0.086	0.077	0.070	0.110
Age 55-64	0.110	0.106	0.089	0.148	0.129	0.112	0.091	0.134
<= 8 years school	0.051	0.042	0.033	0.019	0.097	0.071	0.060	0.038
9-12 years school	0.112	0.092	0.075	0.040	0.132	0.111	0.097	0.059
12 years school	0.480	0.455	0.422	0.279	0.374	0.388	0.387	0.321
13-15 years school	0.189	0.217	0.243	0.326	0.196	0.197	0.211	0.276
16 years school	0.107	0.121	0.143	0.226	0.116	0.131	0.144	0.205
>16 years school	0.060	0.073	0.084	0.110	0.085	0.101	0.101	0.101
Union member	0.169	0.152	0.129	0.120	0.301	0.255	0.197	0.139
Union coverage	0.026	0.035	0.024	0.014	0.026	0.031	0.021	0.012
Not member or covered	0.805	0.813	0.847	0.866	0.673	0.714	0.782	0.849
Observations	6,975	76,122	84,613	76,960	8,343	88,093	90,766	77,656

Source: 1980 is from May CPS; other years are from MORGs.

Appendix Table 2: Means of industries

	Women				Men			
	1980	1983	1990	2008	1980	1983	1990	2008
Agriculture/forestry	0.005	0.005	0.004	0.003	0.019	0.019	0.015	0.012
Mining/petroleum/coal	0.004	0.005	0.003	0.002	0.017	0.019	0.013	0.012
Construction	0.009	0.010	0.010	0.013	0.086	0.089	0.095	0.109
Furniture/wood	0.006	0.005	0.006	0.004	0.015	0.018	0.020	0.012
Non-metallic minerals	0.003	0.003	0.003	0.002	0.012	0.009	0.009	0.006
Metals	0.013	0.010	0.008	0.005	0.053	0.035	0.031	0.022
Machinery except electrical	0.017	0.014	0.012	0.005	0.051	0.039	0.034	0.016
Electrical machinery	0.026	0.023	0.017	0.011	0.029	0.026	0.023	0.020
Transportation equipment	0.011	0.011	0.012	0.009	0.037	0.039	0.037	0.028
Misc manufacturing	0.014	0.012	0.011	0.008	0.014	0.013	0.012	0.011
Food/beverage/tobacco	0.012	0.014	0.013	0.011	0.025	0.025	0.023	0.018
Textile/apparel/leather	0.041	0.036	0.025	0.006	0.015	0.014	0.012	0.004
Paper/printing	0.021	0.020	0.020	0.011	0.025	0.029	0.028	0.016
Chemicals	0.010	0.009	0.008	0.007	0.021	0.018	0.017	0.013
Plastics/rubber	0.007	0.006	0.005	0.003	0.008	0.010	0.009	0.006
Transportation/warehousing	0.017	0.021	0.026	0.025	0.059	0.061	0.063	0.066
Broadcasting/communication	0.018	0.017	0.015	0.012	0.018	0.017	0.015	0.019
Utilities/waste management	0.007	0.007	0.006	0.005	0.023	0.026	0.023	0.021
Wholesale trade	0.024	0.026	0.024	0.018	0.054	0.056	0.052	0.039
Retail trade	0.119	0.125	0.124	0.114	0.100	0.098	0.102	0.111
Finance	0.043	0.048	0.046	0.045	0.016	0.020	0.021	0.028
Insurance/real estate	0.043	0.042	0.046	0.039	0.026	0.026	0.028	0.024
Private households	0.022	0.017	0.013	0.010	0.003	0.003	0.002	0.001
Business services	0.027	0.032	0.045	0.043	0.026	0.035	0.049	0.065
Repair	0.004	0.002	0.002	0.003	0.013	0.015	0.017	0.019
Personal services	0.027	0.029	0.033	0.029	0.011	0.014	0.017	0.015
Arts/entertainment	0.006	0.009	0.010	0.018	0.008	0.011	0.011	0.021
Hospitals	0.086	0.086	0.077	0.080	0.018	0.022	0.020	0.022
Healthcare except hospitals	0.060	0.065	0.073	0.107	0.009	0.008	0.010	0.022
Educational services	0.136	0.126	0.124	0.150	0.053	0.060	0.055	0.058
Social assistance	0.026	0.024	0.030	0.035	0.015	0.006	0.007	0.006
Other professional services	0.027	0.035	0.043	0.059	0.023	0.029	0.031	0.049
Public administration	0.052	0.048	0.050	0.051	0.070	0.060	0.059	0.057
Food services	0.056	0.058	0.056	0.058	0.026	0.033	0.039	0.050
Observations	6,975	76,122	84,613	76,960	8,343	88,093	90,766	77,656

Source: 1980 is from May CPS; other years are from MORGs.

Appendix Table 3: Oaxaca decomposition of women's share in bottom and top wage groups

	1980-1990 May 1980, MORG 1990		1983-1990 MORGs		1990-2008 MORGs	
	ΔX	Δβ	ΔX	Δβ	ΔX	Δβ
	(1)	(2)	(3)	(4)	(5)	(6)
A. Bottom	-0.271		-0.640		-0.368	
	(0.068)		(0.041)		(0.013)	
Age	-0.121	0.038	-0.139	0.024	-0.075	0.005
	(0.011)	(0.014)	(0.008)	(0.009)	(0.003)	(0.003)
Education	-0.192	-0.124	-0.140	-0.051	-0.176	-0.041
	(0.011)	(0.057)	(0.008)	(0.034)	(0.005)	(0.012)
Industry	0.010	-0.196	-0.006	-0.205	0.025	-0.037
	(0.012)	(0.089)	(0.009)	(0.053)	(0.004)	(0.018)
States	0.011	-0.018	0.004	-0.101	-0.000	0.071
	(0.008)	(0.078)	(0.005)	(0.046)	(0.001)	(0.014)
Union	0.067	-0.129	0.073	-0.005	0.007	-0.165
	(0.007)	(0.127)	(0.005)	(0.071)	(0.001)	(0.028)
Occupation	-0.088	0.091	-0.123	-0.076	-0.058	0.022
	(0.015)	(0.163)	(0.009)	(0.076)	(0.004)	(0.022)
Constant	--	0.380	--	0.103	--	0.056
		(0.238)		(0.129)		(0.044)
Sum	-0.313	0.042	-0.331	-0.310	-0.279	-0.090
	(0.036)	(0.062)	(0.022)	(0.036)	(0.008)	(0.012)
Observations	87,143		156,290		157,128	
B. Top	0.699		0.623		0.435	
	(0.037)		(0.024)		(0.011)	
Age	0.052	-0.031	0.075	-0.029	0.069	-0.021
	(0.006)	(0.008)	(0.004)	(0.006)	(0.003)	(0.003)
Education	0.165	-0.131	0.124	-0.089	0.168	-0.009
	(0.011)	(0.032)	(0.007)	(0.022)	(0.005)	(0.011)
Industry	-0.011	-0.004	-0.011	0.057	-0.026	-0.002
	(0.007)	(0.051)	(0.004)	(0.033)	(0.003)	(0.016)
States	-0.003	0.114	-0.000	0.100	-0.005	-0.002
	(0.005)	(0.044)	(0.003)	(0.029)	(0.001)	(0.013)
Union	-0.031	0.093	-0.028	0.014	-0.005	-0.001
	(0.004)	(0.072)	(0.003)	(0.044)	(0.001)	(0.025)
Occupation	0.104	-0.173	0.116	-0.081	0.097	0.006
	(0.012)	(0.092)	(0.006)	(0.047)	(0.004)	(0.019)
Constant	--	0.556	--	0.375	--	0.165
		(0.136)		(0.081)		(0.040)
Sum	0.276	0.424	0.275	0.348	0.299	0.136
	(0.021)	(0.037)	(0.013)	(0.023)	(0.008)	(0.011)
Observations	91,588		160,735		161,573	

Note: Annualized changes multiplied by 100. Standard errors in parentheses. For the bottom shares, 1989 is used instead of 1990.

Appendix Table 4: Oaxaca decomposition of men's share in bottom and top wage groups

	1980-1990 May 1980, MORG 1990		1983-1990 MORGs		1990-2008 MORGs	
	ΔX	Δβ	ΔX	Δβ	ΔX	Δβ
	(1)	(2)	(3)	(4)	(5)	(6)
A. Bottom	0.558		0.225		-0.110	
	(0.044)		(0.028)		(0.011)	
Age	-0.101	0.012	-0.094	0.017	-0.089	0.011
	(0.014)	(0.011)	(0.008)	(0.007)	(0.003)	(0.003)
Education	-0.128	-0.012	-0.064	-0.032	-0.101	-0.029
	(0.009)	(0.023)	(0.005)	(0.015)	(0.003)	(0.007)
Industry	0.061	0.089	0.043	-0.013	0.024	0.008
	(0.009)	(0.037)	(0.005)	(0.023)	(0.003)	(0.011)
States	-0.001	0.008	-0.003	-0.066	-0.000	0.074
	(0.005)	(0.051)	(0.003)	(0.032)	(0.001)	(0.013)
Union	0.127	0.187	0.110	0.003	0.029	-0.103
	(0.007)	(0.077)	(0.005)	(0.048)	(0.002)	(0.026)
Occupation	0.008	0.061	-0.015	0.086	-0.026	0.036
	(0.011)	(0.067)	(0.006)	(0.038)	(0.003)	(0.015)
Constant	--	0.246	--	0.253	--	0.055
		(0.124)		(0.078)		(0.037)
Sum	-0.033	0.591	-0.023	0.248	-0.163	0.053
	(0.027)	(0.040)	(0.016)	(0.024)	(0.007)	(0.011)
B. Top	-0.171		-0.174		0.194	
	(0.054)		(0.032)		(0.013)	
Age	0.039	-0.022	0.073	-0.017	0.105	0.005
	(0.012)	(0.012)	(0.007)	(0.008)	(0.003)	(0.004)
Education	0.168	-0.089	0.075	-0.121	0.122	-0.001
	(0.013)	(0.028)	(0.008)	(0.017)	(0.004)	(0.008)
Industry	-0.040	-0.016	-0.037	-0.018	-0.018	-0.007
	(0.008)	(0.045)	(0.005)	(0.027)	(0.003)	(0.013)
States	0.019	0.029	0.013	0.095	-0.004	-0.038
	(0.006)	(0.063)	(0.004)	(0.036)	(0.002)	(0.015)
Union	-0.109	0.024	-0.091	0.005	-0.042	-0.024
	(0.007)	(0.094)	(0.005)	(0.054)	(0.002)	(0.029)
Occupation	0.003	-0.094	0.038	-0.030	0.080	-0.051
	(0.014)	(0.082)	(0.007)	(0.043)	(0.004)	(0.017)
Constant	--	-0.083	--	-0.159	--	0.067
		(0.151)		(0.088)		(0.041)
Sum	0.081	-0.251	0.071	-0.245	0.243	-0.049
	(0.029)	(0.049)	(0.017)	(0.028)	(0.009)	(0.012)
Observations	99,109		178,859		168,422	

Note: Annualized changes multiplied by 100. Standard errors in parentheses.